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THE PHILIPPINE BUTTERFLY FISHES AND THEIR ALLIES

By ALBERT W. HERRE and HERACLIO R. MONTALBAN

Of the Division of Fisheries, Bureau of Science, Manila

TWENTY-FOUR PLATES

Series CHÆTODONTIFORMES

We include here all those fishes belonging to the suborder Squamipinnes which have a deep, greatly compressed, suborbicular, or rhomboidal body, covered with finely ctenoid or smooth scales which extend upon the soft dorsal, anal, and caudal, and often upon the spinous part of the dorsal, so that the distinction between body and vertical fins is more or less effaced; the mouth is small, terminal, with lateral cleft, toothless palate and vomer, except in *Platax*, which may have a few vomerine teeth; the maxillaries have villiform or bristlelike teeth (trilobed in *Platax*), with neither incisors, canines, nor molars; in most, if not in all, the mesethmoid is depressed, a character typical of the chætodonts; the dorsal fin consists of an undivided spinous and soft portion, usually of nearly equal development; the anal has three or four spines, the rayed portion similar to the soft dorsal; the lower rays of the pectoral fin are branched, not enlarged; the thoracic ventrals have one spine and five rays; the stomach cæcal, the pyloric appendages few to many, the intestines much convoluted; the air bladder may be constricted or with horns; the lateral line is continuous, but may be incomplete; vertebræ 10 + 14 or 10 + 13; pseudo-branchiæ well developed.

In the Chætodontidæ and Scatophagidæ the young are very different from the adults and were first described as the genus *Tholichthys*; in them the bones of the head and shoulder girdle

form enormously enlarged plates which may entirely cover the head and hide the dorsal and ventral fins; as the young develop the plates are absorbed, but those attached to the shoulder girdle remain until the larva assumes the shape of the adult. The very young stages of the other groups are not known.

The members of this group are typical fishes of the coral reef, in the coves and depths of which they swarm, and they also love to dwell along precipitous rocky or lava coasts. Most of the species have long been known, the beauty and singularity of their colors being unsurpassed and attracting the attention of man from the earliest times. Most of them are small, and as they do not occur in vast schools comparatively few are of any importance as food. The flesh of some of the holacanthids has a delicious flavor, so that they are much prized locally.

All of our species are exclusively marine, with the exception of *Scatophagus*.

In this paper the length does not include the caudal fin, unless so stated.

Under the Chætodontiformes we include five families of fishes as follows:

- a*¹. First dorsal spine recumbent and directed forward.
 - b*¹. Dorsal spines 8 or 9, the third longest and flexible; anal spines 3; pectoral elongate, falciform..... **Drepanidæ.**
 - b*². Dorsal spines 10 or 11; pectoral short, not falciform.
 - c*¹. Fifth dorsal spine longest, not filiform, 1.2 to 1.6 times in head; anal spines 4..... **Scatophagidæ.**
 - c*². Fourth, fifth, and sixth dorsal spines much longer than head, with elongate threadlike tips; anal spines 3..... **Ephippidæ.**
- a*². First dorsal spine erect, not directed forward.
 - d*¹. Dorsal and anal moderate, not greatly elevated; ventrals not remarkably elongate, their origin behind that of pectorals; dorsals continuous, spines 6 to 16, rays 15 to 30; anal spines 3 or 4, rays 15 to 23, teeth in several rows, simple, rarely tricuspid. **Chætodontidæ.**
 - d*². Both dorsal and anal greatly elevated; ventrals very noticeably elongate, their origin before that of pectorals; dorsal spines 3 to 7, nearly hidden, rays 28 to 54; anal spines 3, rays 22 to 29; outer row of teeth tricuspid..... **Platacidæ.**

DREPANIDÆ

Body very deep, much compressed, greatly elevated at origin of dorsal, covered with medium-sized scales; pectoral falcate, very long, reaching or nearly reaching base of caudal. First dorsal spine recumbent and directed forward; dorsal spines 8 or 9, folding into a basal groove, the membrane deeply notched be-

tween the spines; head much deeper than long, with very steep profile and short snout; preopercle smooth; palate without teeth; air bladder prolonged posteriorly into two horns; pyloric appendages few; branchiostegals 6; pseudobranchiæ present.

One genus with two species inhabiting the Indian Ocean and seas of the Indo-Australian Archipelago.

Genus DREPANE Cuvier and Valenciennes

Drepane CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 97.

The characters of the genus are sufficiently indicated under the family.

Key to the species of *Drepane*.

- a*¹. Body with 4 to 11 vertical rows of black spots; air bladder with 2 pairs of lateral cæca, the posterior ones very long..... *D. punctata*.
*a*². Body with 4 to 9 vertical black bands from back to lateral line and middle of body; air bladder with about 15 pairs of much-branched lateral cæca *D. longimana*.

DREPANE PUNCTATA (Linnaeus). Plate 1, fig. 1.

Chætodon punctatus LINNÆUS, Syst. Nat. ed. 10 1 (1758) 273.

Drepane punctata CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 99, pl. 179; GÜNTHER, Cat. Fishes 2 (1860) 62, B; Fische der Südsee 1 (1873) 55; DAY, Fishes of India (1878) 116, pl. 29, fig. 5, text pro parte; JORDAN and SEALE, Bull. Bur. Fisheries 26 (1906); 33; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 268; LELE, Journ. Asiatic Soc. Bengal N. S. 20 (1924) (1925) 285, pl. 12, fig. 1, and 6 text figs.

Harpoichirus punctatus CANTOR, Cat. Malayan Fishes, Journ. Roy. Asiatic Soc. Bengal 18 (1849) 162; BLEEKER, Atlas Ichth. 9 (1878) 19, pl. 365, fig. 4, text and synonymy pro parte.

Local names.—Bicol, *riring*; Tagalog, *mayang*; Visayan, *bayang*.

Dorsal IX, 21; anal III, 18; there are 46 to 48 scales in a lateral series, 15 to 18 between the lateral line and the origin of dorsal, 32 or 33 between the lateral line and the origin of anal.

The exceedingly deep body much compressed and strongly elevated, the deepest part vertically from the base of the first three dorsal spines contained from 1.1 to 1.2 times in the length; the dorsal and ventral profiles more or less angular at origin of dorsal and origin of anal, between which points the depth of the body is slightly less than its length in large examples, and a little greater in small ones; anterior half of dorsal profile steep and a little convex and that of ventral profile before anal fin very oblique and almost straight; head much deeper than long, its upper profile exceedingly steep and much more

elevated than ventral, length 2.6 to 2.9 times in that of body; the short caudal peduncle very deep and strongly compressed, its least depth 6 to 7.2 times in length of body; the inter-orbital space is moderately convex and bulges up slightly on the upper profile of head, its width 3.5 to 4.1 times in head; the rounded eye very much elevated and anterior, its diameter 3.1 to 3.5 times in head and slightly shorter than width of preorbital or length of maxillary, which is contained from 2.8 to 3.3 times; the mouth small and horizontal, the jaws even, the teeth pointed and slender, crowded together, no teeth on vomer and palate, the maxillary extending to below front third of orbit; the two nostrils in front of each eye rounded and very well separated, the front one a little more superior than the other and each having a low fleshy rim; only the angle and lower limb of preopercle serrated.

The scales on side of body moderate in size, those on head, vertical fins, and caudal becoming very small; the lateral line is concurrent with the form of the back and extends to base of caudal fin; the dorsal fin deeply emarginate, the first spine concealed, recumbent, pointed forward, the third spine highest, 1.2 to 1.6 times in head, the last one about as long as third anal, which is 2.1 to 3 times in head; the soft dorsal rounded, highest along the middle; the posterior margin of anal nearly vertical; last rays very short; the anal and caudal both a little convex centrally; the elongate and falcate pectoral nearly twice the head and from 1.2 to 1.6 times in the length of body, reaching to or nearly to root of caudal fin; the first ray of ventral elongate; the spine is 1.5 to 2.5 times in head and extends to or beyond anal opening.

In young examples the superior rim of orbit and the upper edge of occipital process serrated, while in still younger ones in addition to the above there is a roughened ridge connecting the upper rim of orbit with the lateral line.

The rather small air bladder has two very short anterior horns and two long, tubular posterior horns; at each anterior angle are two cæca, the posterior of which sends out lateral flattened branches extending halfway or nearly the whole length of the bladder; the cæca and branches are held together by a soft transparent connective tissue, so that they look like a thin ribbon lying between the bladder and the body wall; there is also a pair of very short cæca between the posterior horns.

The intestine is twisted into two knots in addition to its loops; pyloric cæca 2.

This strangely shaped fish is bright silvery in life, with beautiful purple reflections on sides, over which is a golden luster; on each side of body are four to eleven vertical series of black spots on the dorsal half, confluent in the young; the edges of the fins grayish; an indistinct band of similar color along middle of dorsal.

In alcohol the ground color varies from yellowish to yellowish brown, with silvery reflections; the spots on body purplish brown; the fins grayish on their outward portions.

In addition to many living and fresh specimens in the field, we have examined in the Bureau of Science collection twenty-one Philippine examples, 20 to 285 millimeters long, coming from the following localities: Manila Bay; Malabon, Rizal; San Miguel Bay, Camarines Sur; Taclican and Mangarin, Mindoro; Iloilo, Panay Island; Bantayan Island; Catbalogan, Samar, Misamis, Misamis; and Davao, Mindanao. We have compared these specimens with seven others, 29 to 108 millimeters long, from Hoihow, Hainan; Hongkong; and Sandakan, Borneo.

The first Philippine record of this species is that of Günther, of a fine specimen labeled "Philippine Islands;" it has been also reported previously by Jordan and Seale from Cavite, and by Jordan and Richardson from Lubang and Manila. It occurs from the Red Sea and east coast of Africa, through the seas of India and the Indian Archipelago, to Samoa, northward to China and southward to the northwestern coast of Australia. It reaches a length of about 460 millimeters, and is esteemed highly as food, though the flesh is dry. In the Philippines it is usually caught in *baclad*.

DREPANE LONGIMANA (Bloch and Schneider). Plate 1, fig. 2.

Chætodon longimana BLOCH and SCHNEIDER (1801) 229.

Drepane longimana CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 101; LELE, Journ. Asiatic Soc. Bengal N. S. 20 (1924) (1925) 286, pl. 12, fig. 2, and 6 text figs.

Drepane punctata GÜNTHER, Cat. Fishes 2 (1860) 62, A and C; DAY, Fishes of India (1878) 116, pro parte.

Harporchirus longimana CANTOR, Journ. Roy. Asiatic Soc. Bengal 18 (1849) 163; FOWLER and BEAN, Proc. U. S. Nat. Mus. 62 (1922) 54.

Cryptosmilia luna COPE, Trans. Am. Phil. Soc. 13 (1869) 401.

Drepane octofasciata OSORIO, Journ. Sci. Acad. Lisboa II 2 (1892) 207.

Dorsal IX, 21; anal III, 18; there are 48 scales in a lateral series, 15 between the lateral line and the origin of dorsal, 33 between the lateral line and the origin of anal.

The deepest portion of the much-compressed and strongly elevated body is vertically at the base of the first three dorsal spines and contained 1.2 times in the length; the upper and lower profiles more or less angular at origins of vertical fins, between which points the depth of body is nearly equal to its length; the anterior half of the dorsal profile steep and slightly convex, that of the ventral very oblique and almost straight; the head much deeper than long, its length 2.7 to 3 times in length of body, and its upper profile more strongly elevated than the ventral and almost vertical anteriorly; the least depth of the short, strongly compressed caudal peduncle 6 to 6.7 times in length of body; the moderately convex interorbital bulges up slightly on upper profile of head, its least width 3.2 to 3.5 times in head and equal to the diameter of the rounded, much-elevated eye; the snout is almost vertical above, 2.1 to 2.5 times in head, and exceeds the maxillary which is contained 2.8 to 2.9 times; the least width of the preorbital nearly equal to length of maxillary and 2.8 to 3.2 times in length of head; the mouth rather small and nearly horizontal, the jaws even, the teeth pointed and slender, crowded together; teeth absent on vomer and pal-ate; the maxillary extends to a little past vertical from anterior edge of eye; two small rounded nostrils in front of each eye, the anterior one a little more superior than the other and both having a low fleshy rim; the preopercle serrated at its angle and lower edge.

Moderate scales cover each side of body, becoming very small on head, vertical fins, and caudal; the lateral line follows the form of the back and extends to base of caudal fin, arching most strongly below base of middle dorsal spines; in front of this arch the lateral line very slightly concave or almost straight; the fourth spine of the deeply emarginate dorsal highest, being 1.6 to 1.8 times in head, the last one 2.9 to 3.2 times in head and much lower than ventral spine which is contained 1.8 to 2.2 times; the rounded soft dorsal highest at middle; the anal rays and the caudal a little convex along middle; the elongate and falcate pectoral is nearly twice the length of head and reaches to caudal peduncle; the ventral fin extends to base of anterior anal rays, its spine 2.8 to 2.9 times in length of head.

The large air bladder has two short anterior and two long tubular posterior horns, the bladder larger and the posterior horns longer than in *D. punctata*; on each side of bladder are about fifteen intricately branched cæca, beginning at its top and extending down upon the posterior horns; the cæca and branches

are encased in soft transparent connective tissue and form a triangular ridge on each side, the ridges fitting into special pockets between the ribs; there are three pairs of cæca on the inner margins of the posterior horns.

The intestine is looped as in *D. punctata*, but has no knots; pyloric cæca 3.

The color of this fish in life is bright silvery, with a beautiful purplish tinge on sides, over which is a golden luster; eight black transverse bands descending from back to middle of side, or some may stop at the lateral line.

In alcohol the ground color is yellowish brown, with silvery reflections; the bands on the sides blackish; all the fins are blackish on their outward portions.

The above description is taken from a specimen, 87 millimeters long, collected at Estancia, and one, 122 millimeters long, taken at Barotac Nuevo, Panay.

This species, which may have been recorded previously from the Philippines as *Drepane punctata*, occurs from the west and east coasts of Africa and the Red Sea, eastward to Australia.

SCATOPHAGIDÆ

A group of chaetodontoid fishes with subrhomboid or somewhat quadrangular and strongly compressed body, covered with small, smooth ctenoid scales; snout moderate; two dorsals united basally, the spinous dorsal with 11 or 12 spines, the first recumbent and pointed forward, the rayed portion shorter than the spinous, with 16 to 19 rays; anal spines 4, rays 14 to 16; preopercle spineless, palate and vomer toothless; teeth tricuspid; air bladder simple; pyloric appendages rather numerous; branchiostegals 6; pseudobranchiæ present.

A small family of fishes confined to the Indian Ocean and Indo-Australian Archipelago, with but one genus and only two or three valid species.

Genus SCATOPHAGUS Cuvier and Valenciennes

Scatophagus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 103.

Scales very small, 90 to 130 in longitudinal series; spinous dorsal scaleless, the soft dorsal, anal, and caudal scaled; pectoral short, rounded; head scaled everywhere; maxillary not protractile.

Fishes of both fresh and salt water, the flesh of excellent flavor but not valued in some regions because of their feeding habits about inhabited places.

SCATOPHAGUS ARGUS (Boddaert). Plate 2, fig. 2; Plate 12, fig. 2.

Chætodon argus BODDAERT, Over den gevlakten klipvisch (1770); BLOCH, Ichthyologie 6 (1788) 63, pl. 204, fig. 1; BONNATERRE, Ichthyologie (1788) 86, pl. 94, fig. 386; GMELIN, Syst. Nat. ed. 13 (1788) 1248.

Scatophagus argus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 103; GÜNTHER, Cat. Fishes 2 (1860) 58; KNER, Reise Novara, Fische (1865) 106; PETERS, Monatsber. Akad. Wiss. Berlin (1868) 257; DAY, Fishes of India (1878) 114, pl. 29, fig. 3; MEYER, Ann., Soc. España Hist. Nat. 14 (1885) 18; SEALE and BEAN, Proc. U. S. Nat. Mus. 33 (1907) 246, fig. 8; WEBER, Fische Siboga Exped. (1913) 302, pl. 10, figs. 1-5.

Ephippus argus CUVIER, Règne Anim. ed. 1 2 (1817) 335; BLEEKER, Atlas Ichth. 9 (1879) 21, pl. 363, fig. 2; JORDAN and SEALE, Proc. U. S. Nat. Mus. 28 (1905) 789; SMITH and SEALE, Proc. Biol. Soc. Wash. 19 (1906) 78; JORDAN and SEALE, Bull. Bur. Fisheries 26 (1906) 32; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1906) 97; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 268.

Chætodon pairatalis BUCHANAN HAMILTON, Fishes Ganges (1822) 122, 372, pl. 14, fig. 41.

Scatophagus ornatus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 108, pl. 180; GÜNTHER, Cat. Fishes 2 (1860) 59; KNER, Reise Novara, Fische (1865) 272.

Chætodon atromaculatus BENNETT, Fishes Ceylon 18 (1834) pl. 18; very fine figure.

Common names.—Bicol, *bayang*, *kikiro*; Tagalog, *kitang*; Visayan, *akikiro*, *ngisi-ngisi*; Ilocano, *malaga*.

Dorsal XI, 16 to 18; anal IV, 14 or 15; there are 90 to 128 scales in a lateral series, 28 to 34 between the lateral line and the origin of dorsal, and 55 to 82 between the lateral line and the origin of anal.

The depth of the somewhat quadrangular and strongly compressed body contained from 1.5 to 1.7 times in the length, with the back more strongly elevated than the ventral outline; the head about as long as deep, 2.9 to 3.3 times in length of body, its upper profile slightly arched at interorbital space; the depth of the short, strongly compressed caudal peduncle 6.1 to 7.3 times in length of body; the strongly arched interorbital space rather wide, 2.4 to 2.7 times in head and a little wider than the bluntly rounded snout, which is contained from 2.7 to 3.2 times in head; the eye circular and rather small, a little closer to tip of snout than to posterior edge of preopercle, and about midway in depth of head, its diameter 3.3 to 4.3 times in head and longer than the short maxillary which is contained from 3.6 to 4.7 times; the width of preorbital at end of maxillary

5.6 to 6.7 times in length of head; the mouth small and horizontal with villiform teeth and equal jaws; the two nostrils in front of each eye rather well separated and about as far from each other as the posterior one is from orbit, the anterior one circular and having a fleshy rim which is highest behind, the other an almost ovoid opening with a low fleshy rim; the lower edge of preorbital serrated; none of the opercular bones serrated.

The scales on the sides are generally small, becoming very small to minute on head, vertical fins, and caudal; the moderately arched lateral line extends to base of caudal fin; the first dorsal spine recumbent and pointed forward; the fifth dorsal spine highest and contained from 1.2 to 1.6 times in head; the last one a little lower than fourth anal spine which is 1.9 to 2.6 times in head; the anterior dorsal and anal rays longest, the posterior ones very short so that the posterior margin of each fin is inclined diagonally forward; the caudal fin fan-shaped; the short, rounded pectoral is 1.7 to 2.2 times in head and extends beyond a vertical through anus; the outer ray of ventral is produced and reaches to origin of anal fin; the spine goes 1.5 to 1.9 times in length of head and ends behind anus.

In very young examples, 36 millimeters long or less, there is a bony ridge from upper rim of orbit across opercle to shoulder, where it ends in a spine.

In life the ground color varies from violet-brown to dark brown, becoming paler on belly and having a beautiful purplish gloss, so that the fish has the bright new look of a freshly minted coin; each side of body has a number of scattered blackish rounded spots which are more numerous along the back, and vary in number, size, and tint; more rarely the spots are greenish.

Young living specimens are ornately colored and very beautiful; the ground color is olive brown, with about five black transverse bands which disappear sooner or later, and with rounded black spots scattered over the upper half; the head and anterior part of body have two or three crossbands of yellow, orange, or orange red, and three spots of the same color along the back, one at origin of dorsal, a larger one below the junction of the spinous and soft dorsals, and one on top of caudal peduncle below soft dorsal; soft dorsal, anal, and caudal colorless; ventrals black.

In alcohol the ground color of the fish varies from purplish to dark yellowish brown, becoming paler below and with rounded blackish spots scattered on each side of body; the vertical fins, caudal, and ventral dark brown; the pectoral yellowish.

The foregoing account is based upon an examination of many living and fresh specimens in the field and seventy-eight alcoholic examples, varying from 9 to 196 millimeters in length. Fifty-five of them were collected at the following Philippine localities:

Buguey, Cagayan.	Bintoan, Busuanga Island.
Vigan, Ilocos Sur.	Bantayan Island.
Barrio Nalva, Luna, La Union.	Iloilo, Panay.
Alaminos, Pangasinan.	Estancia, Panay.
Iba, Zambales.	Taytay, Palawan.
Malabon, Rizal.	Inabanga, Bohol.
Manila.	Cabalian, Leyte.
Bicol River, Camarines Sur.	Agusan River.
Pasig River.	Malabang and Davao, Mindanao.
Molawin Creek, Laguna de Bay.	Balabac Island.
Calapan, Mindoro.	Tubigan Island, Sulu Archipelago.
Bacon, Sorsogon.	
Catarman, Samar.	

The rest of the specimens were collected at Sandakan, Borneo; Foochow, Fukien Province; Hoihow, Hainan; and Hongkong, on the coast of China. The two specimens, collected at Estancia February 23, 1925, are ripe females.

The dorsal, anal, and ventral spines are all strong and sharp, the latter especially being very stout; with its spines the kitang is able to inflict grievous wounds, so that it is much dreaded by fishermen, who do not like to handle it. This fish is common in both salt and fresh water, freely entering rivers and lakes and ascending streams for a considerable distance. Very young as well as mature specimens are found in fresh water, though it is not definitely known to breed there. It reaches a length of over 300 millimeters, and is much used as food, in spite of the fact that in many places it feeds largely on human excrement, as its scientific name indicates. Bennett, whose figure is the best published, says that it feeds principally on seaweed and he, as well as many others, highly commend the flavor of its flesh. It takes the hook freely, whether in fresh or in salt water, and is often caught in traps and fish corrals.

Seale and Bean described and figured a young specimen in the armored, or *Tholichthys*, stage characteristic of the chaetodonts, and Weber has a beautiful series of figures showing the various phases of this stage. We have six specimens, taken from Pasig River, Manila, each 9 millimeters in length, which show the characteristic bony plate armor of the head and shoulder girdle very well. We have kept many living specimens under

observation for over five years, and have watched the young go through all their transformations and color changes until they became adult.

This handsome fish has been reported from the Philippines previously as follows: By Peters, Quingoa River at Calumpit, and Bicol River, Luzon; by Meyer, Manila Bay and Cebu; by Seale and Bean, Zamboanga; by Jordan and Seale, Negros and Cavite; by Smith and Seale, Cotabato, Mindanao; by Evermann and Seale, Bacon, Sorsogon Province, and San Fabian, Pangasinan Province; by Jordan and Richardson, Manila and Iloilo.

It is widely distributed in the Philippines and is common throughout the East Indies; it ranges eastward in the Pacific to Tahiti, northward to the coast of China, and westward to the Andaman Islands, India, and Ceylon. In spite of the very considerable variation in scalation and other characters we can recognize but one species.

EPHIPPIDÆ

The members of this family have a much elevated, nearly circular, and laterally compressed body; the snout short, the upper profile parabolic; the dorsal has 9 or 10 spines, the first recumbent and directed forward, several of the others elongated, flexible, with threadlike tips all folding into a basal groove; membrane between the spines deeply cleft and a deep notch between dorsal spines and rays; anal spines 3; scales moderate to small, extending upon the soft dorsal, anal, and caudal, but not on the other fins; pectoral short; no teeth on palate; no spine on preopercle. The air bladder is bifurcate anteriorly and has two long horns posteriorly; pyloric appendages few. Branchiostegals 6; pseudobranchiæ present.

A small family of orbiculate fishes, with but one genus known; species few, occurring in the Atlantic and the East Indies.

Genus EPHIPPUS Cuvier

Ephippus CUVIER, Règne Anim. 2 (1817) 335.

The characters of the genus are indicated under the family.

EPHIPPUS ORBIS (Bloch). Plate 2, fig. 1.

Chætodon orbis BLOCH, Ichtyologie 6 (1788) 59, pl. 202, fig. 2.

Ephippus orbis CUVIER, Règne Anim. Poiss. ed. 2 2 (1829) 108; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 96; GUÉRIN, Icon. Règne Anim. Poiss. (1830-1844) pl. 22, fig. 2; GÜNTHER, Cat. Fishes 2 (1860) 62; DAY, Fishes of India (1878) 115, pl. 29, fig. 1; SEALE, Philip. Journ. Sci. § D 5 (1910) 282.

Ilarches orbis CANTOR, Cat. Malayan Fishes, Proc. Roy Asiatic Soc. Bengal 18 (1849) 100; BLEEKER, Atlas Ichthy. 9 (1878) 20, pl. 365, fig. 5.

Ephippus melanopus BLEEKER, Nat. Gen. Arch. Ned. Ind. 2 (1845) 520.

Dorsal X, 19; anal III, 15; there are 35 scales in a lateral series; 10 between the lateral line and the origin of dorsal, and 14 between the lateral line and the origin of anal.

The very deep and much compressed body nearly circular; the upper profile is much more elevated than the lower and rises abruptly from snout to origin of dorsal fin; the depth contained 1.3 times in length; the head much deeper than long, its length 3 to 3.1 times in that of body and its upper profile a little convex; the least depth of the short and strongly compressed caudal peduncle contained from 6.8 to 6.9 times in length of body; the large, rounded eye 2.2 to 2.5 times in head, and slightly anterior in length; the interorbital space markedly arched and moderate in width, being 2.6 to 3 times in head; the bluntly rounded snout nearly vertical and about equal to eye, 2.3 times in length of head in our specimens; the short maxillary extends to opposite anterior margin of orbit and is 3.2 to 3.3 times in head; the width of preorbital at end of maxillary nearly half an eye diameter, and 4.2 to 4.3 times in head; the mouth small and horizontal, the jaws even; the teeth slender and pointed, absent on palate; two small nostrils rather well separated from each other in front of each eye, the anterior one circular with a low fleshy rim and the other a vertical slit very close to the rim of the orbit; the preopercle distinctly serrated.

The scales moderate in size; those on top of head and neck, and on outer portions of vertical and caudal fins very small; the moderately arched lateral line extends to base of caudal fin; the fourth, fifth, and sixth dorsal spines elongated and filiform at their tips, each being much longer than head; the first spine is a recumbent one directed forward; the rayed dorsal highest along its middle and the soft anal on its anterior portion; the caudal fin produced along the middle, and somewhat emarginate above and below; the pectoral short and slightly more than half the length of head, not extending to above anus; the ventral terminates at base of anal spines, its outer ray filiform and its spine about as long as pectoral.

The color in alcohol yellowish silvery; on each side of body are bright silvery longitudinal stripes which run between the horizontal rows of scales; the membranous portions of the fins finely dotted with black.

The Bureau of Science collection contains no specimens taken in Philippine waters, though this species unquestionably occurs within the limits of the Archipelago. Our description is based upon two specimens, 104 millimeters in length, collected by Alvin Seale at Sandakan, Borneo. Any marine fish listed from British North Borneo must likewise occur in Philippine waters between Balabac and Sitankai, since all that region belongs to Borneo geographically.

Elsewhere this species is known from India, Ceylon, and the Andaman Islands, through the East Indies to the coast of China and Formosa.

CHÆTODONTIDÆ

BUTTERFLY FISHES

The characteristic family of the Squamipinnes, or scaly-finned fishes, is the Chætodontidæ, represented in the Philippines by nine genera. The compressed body varies from subrhomboid to nearly circular, and is covered with medium-sized to small scales; the mouth small, terminal, protractile; the jaw teeth bristle- or brushlike, often very long; no teeth on vomer or palatines; no incisors, canines, or molars; the lateral eyes of moderate size; the dorsal fin single, continuous, not notched, its rays sometimes greatly elongated and then more or less filamentous or hairlike; the dorsal and anal rays densely covered with small or very small scales; the anal is similar to the soft dorsal and may have 3 or 4 spines; the lateral line is concurrent with the dorsal outline, and may terminate at the posterior extremity of the soft dorsal or run to the base of the caudal, but it never extends upon the caudal fin; the ventrals are thoracic, I, 5; the caudal is usually truncate; branchiostegals 6 or 7; pseudobranchiæ very large; the gill membranes more or less attached to the isthmus; the gill rakers very small; an air bladder always present; vertebræ $10 + 14 = 24$, the anterior ones shortened; the insertion of the ribs inferior.

This family includes several genera of very active coral-reef fishes, mostly small, and nearly all of remarkable brilliance and beauty of color.

Key to the Philippine genera of the Chætodontidæ.

α^1 . Snout elongate and tubular.

b^1 . Dorsal spines 9; scales moderate, 45 to 55 in lateral series.. *Chelmon*.

b^2 . Dorsal spines 12; scales small, 70 to 80 in lateral series.... *Forcipiger*.

α^2 . Snout not elongate and tubular, but short or of medium length.

c^1 . Lateral line terminating before caudal peduncle.

- d*¹. Dorsal spines 6 or 7..... **Parachaetodon.**
*d*². Dorsal spines 11 to 14..... **Chaetodon.**
*c*². Lateral line extending to base of caudal fin.
*e*¹. No long stout spine at lower posterior angle of preopercle; preopercle smooth or nearly so.
*f*¹. Dorsal spines increasing in height to the last; mouth small, with swollen plaited lips, teeth short, scarcely visible.. **Coradion.**
*f*². Dorsal spines decreasing in height posteriorly from third or fourth.
*g*¹. None of the dorsal spines elongated.
*h*¹. Scales in lateral series 55 to 60; dorsal rays 17 or 18; anal rays 14..... **Microcanthus.**
*h*². Scales in lateral series 60 to 75; dorsal rays 24 or 25; anal rays 19 to 21..... **Hemitaurichthys.**
*g*². Fourth dorsal spines elongated, sometimes excessively so, with threadlike tip **Heniochus.**
*e*². A long stout spine at lower posterior angle of preopercle; posterior margin of preopercle serrate or spinous..... **Holacanthus.**

Genus CHELMON Cuvier

Chelmon CUVIER, Règne Anim. ed. 1 2 (1817) 344; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 65.

Chelmo GÜNTHER, Cat. Fishes 2 (1860) 35.

The body strongly elevated and compressed, with an elongate, slender, tubular snout, the mouth forming a small anterior horizontal cleft; the dorsal has 9 spines, none of them elongate; the scales of moderate size, 45 to 55 in a longitudinal series; the palate toothless, the preoperculum unarmed.

The species are few, probably not more than two, and occur from the east coast of Africa to China and Australia. They are typical coral-reef dwellers, and do not enter the mouths of rivers. We need not give credence to the early tales about their shooting insects with drops of water, since there are no bushes or insects about the places where they live.

CHELMON BOSTRATUS (Linnaeus). Plate 3, fig. 1.

Chaetodon rostratus LINNÆUS, Mus. Ad. Fried. 1 (1754) 61, pl. 33, fig. 2; BLOCH, Ichtyologie 6 (1788) 57, pl. 202, fig. 1.

Chelmon rostratus CUVIER, Règne Anim. ed. 1 2 (1817) 190; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 66; PETERS, Monatsber. Akad. Wiss. Berlin (1868) 257; BLEEKER, Atlas Ichthy. 9 (1878) 22, pl. 369, fig. 2; DAY, Fishes of India (1878) 110, pl. 28, fig. 2; JORDAN and SEALE, Bull. Bur. Fisheries 26 (1906) (1907) 33; FOWLER and BEAN, Proc. U. S. Nat. Mus. 62 (1922) 56; AHL, Chaetodontidae, 12, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Dorsal IX, 26 to 30; anal III, 18 to 21; there are 45 to 48 scales in a lateral series, 10 or 11 between the lateral line and the origin of dorsal, and 20 to 22 between the lateral line and the origin of anal.

The body very deep and strongly compressed, the back very much elevated, very trenchant, the depth contained from 1.5 to 1.7 times in the length; the head, which is rather deep, is 2.1 to 2.3 times in the length of body, its upper profile concave from tip of snout to neck; the small, compressed caudal peduncle deeper than long, the depth 4 to 4.8 times in length of head or 9 to 10.6 times in that of body; the interorbital space slightly convex, 5.6 to 7.2 times in head or narrower than the diameter of the circular eye which is contained from 4 to 5.3 times in the length of the head; the snout almost horizontal, nearly twice in head, the jaws produced into a long cylindrical tube, with the small mouth at its extremity, the gape of mouth about two-thirds diameter of eye; the minute teeth arranged in villiform bands in each jaw; the wide preorbital about two-thirds eye, its lower edge finely denticulated; at upper rim of orbit there are small but fine teeth; two nostrils present in front of each eye, the anterior one margined behind with a fleshy flap and the posterior one a simple oblique slit.

The scales covering body moderate in size, those on the fins small to minute; the lateral line is strongly arched and extends to base of caudal fin; the dorsal spines evenly graduated to the last, which is highest, being 1.4 to 1.7 times in length of head; the soft vertical fins highest at about middle, the dorsal slightly angular and the anal rounded; the caudal fin a little convex; the small, rounded pectoral nearly as long as last dorsal spine, its posterior end above base of anal spines; the ventral fin is pointed and ends at base of anterior anal rays, its spine strong and about as long as third anal spine.

The ground color in alcohol very pale or whitish to yellowish brown, traversed by five brownish bands which are edged with brown and white; the first one across head through eye; the three middle ones below dorsal fin; and the last one, which is darker than the others, around tail; a round, black, white-edged spot in the middle of soft dorsal fin near its base; a narrow brownish band, edged with brown and white, running along median line of head; all the fins are colored similarly to body; the soft dorsal and anal narrowly edged with brown and white.

We have studied the following specimens, varying in length from 53 to 90 millimeters:

Manila Bay, 1.
Bantayan Island, 9.
Cebu, Cebu Province, 2.
Estancia, Panay, 3.

Dumangas, Panay, 1.
Inabanga, Bohol, 2.
Tawitawi, Sulu Province, 1.
Sitankai, Sulu Province, 2.

Jagor collected this beautifully marked and trimly elegant fish on the coral reef at Paracale, Camarines Norte, as recorded by Peters, and Jordan and Seale had specimens from Cavite. Elsewhere it occurs from the east coast of Africa through the seas of India and the Malay Archipelago, northward to China, and southeast to the west coast of Australia.

Genus FORCIPIGER Jordan and McGregor

Forcipiger Jordan and McGregor in JORDAN and EVERMANN, Bull. 47, U. S. Nat. Mus. 2 (1898) 1671.

This genus is characterized by its long, high spinous dorsal composed of 12 stout spines; the snout very long and slender, with short, forcepslike jaws at lip; the scales small, 70 to 80 in a longitudinal series; the body exceedingly deep and greatly compressed. One species is known.

FORCIPIGER LONGIROSTRIS (Broussonet). Plate 3, fig. 2.

Chaetodon longirostris BROUSSONET, Descrip. Ichth. 1 (1782) 23, pl. 7.

Chelmon longirostris CUVIER, Règne Anim. ed. 1 2 (1817) 334, pl. 175.

Chelmo longirostris GÜNTHER, Cat. Fishes 2 (1860) 38; Fische der Südsee 2 (1874) 48; DAY, Fishes of India (1878) 109.

Prognathodus longirostris BLEEKER, Atlas Ichth. 9 (1878) 23, pl. 366, fig. 5.

Forcipiger flavissimus JORDAN and MCGREGOR, Rept. U. S. Fish. Comm. 24 (1898) 279.

Chelmon (Forcipiger) longirostris STEINDACHNER, Denkschr. Ak. Wiss. Wien 70 (1900) 499.

Forcipiger longirostris FOWLER, Proc. Ac. Nat. Sci. Phila. (1900) 512; JORDAN and EVERMANN, Bull. U. S. Fish. Comm. 23¹ (1903) 363, pl. 46; WEBER, Fische Siboga Exped. (1913) 310; AHL, Chaetodontidae, 8, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Dorsal XII, 23; anal III, 17 or 18; there are 57 to 60 scales in a lateral series, 14 between the lateral line and the origin of dorsal, and 28 between the lateral line and the origin of anal.

The body very deep and compressed, its greatest depth at anal opening, and contained 2.3 times in length; the small, low head 2.1 to 2.2 times in length of body, its upper profile very strongly concave; the least depth of the small caudal peduncle deeper than its length, 6 to 6.4 times in length of body; the slightly convex interorbital space contained 7.3 to 7.8 times in head; the circular eye situated nearly in the middle of length of head without the beak, its diameter contained from 5.4 to 6 times in head or a little longer than width of interorbital space; the snout nearly horizontal and contained 1.7 times in head, the

jaws equal and produced into a long, nearly tubular beak, at the end of which is the small mouth; the extremely wide pre-orbital 1.3 to 1.5 times diameter of eye, its inferior edge indistinctly serrated; the teeth minute, in villiform bands in jaws; in front of eye are two nostrils, the anterior one in a low fleshy tube and the posterior one an oblique slit.

The scales moderate in size, a low sheath of small scales covers base of spinous dorsal; small to minute scales almost completely cover both the rayed dorsal and anal; the strongly arched lateral line not concurrent with dorsal profile of body; the fourth, fifth, and sixth dorsal spines highest, each being 1.7 to 1.9 times in length of head; the anal spines graduated to the last, which is highest and almost twice in head; both dorsal and anal rays decrease in length posteriorly; the caudal fin rather small and slightly emarginate, its upper ray slightly produced; the falcate pectoral is long and nearly equals head and an eye diameter more and extends posteriorly to above base of anterior anal spines; the ventral fins long and sharply pointed, reaching to base of anal spines.

Two fresh specimens collected at Tagapula Island were brilliant yellow, color deeper and shaded with orange behind; a larger, black, triangular patch covered nape, upper surface of head, and side down to level of lower edge of eye from tip of snout to opercular region; the lower parts of head and breast were livid white; the caudal fin was grayish and the other fins yellow; the anal fin had a large black circular spot at its posterior angle; both soft dorsal and anal had a narrow black margin.

In alcohol the ground color is whitish yellow, the nape and head above the level of lower margin of orbit blackish brown; the caudal fin grayish and the other fins whitish yellow; the soft vertical fins narrowly margined with grayish; a large black circular spot on posterior rays of anal.

Here described from three specimens, 118 to 140 millimeters long, taken at Hamilo, Batangas Province, and Tagapula Island, Samar.

This curious and brightly colored fish, not hitherto known from the Philippines, ranges from the east coast of Africa and Isle de France in the Indian Ocean eastward throughout Polynesia to the offshore islands of Mexico. Apparently it is not common anywhere.

Genus PARACHÆTODON Bleeker

Parachætodon BLEEKER, Versl. Akad. Amsterdam (2) 8 (1874) 371.

This genus is distinguished by the small number of dorsal spines (6 or 7 only) as well as by the nearly circular body; anal spines 3; the snout not much produced, the teeth small and brushlike; the preoperculum finely toothed; the dorsal elongate, the rayed portion more than four times as long as the spinous, the spines successively elongated but the anterior rays much more elevated.

PARACHÆTODON OCELLATUS Cuvier and Valenciennes.

Platax ocellatus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 172.

Parachætodon ocellatus BLEEKER, Atlas Ichth. 9 (1878) 24, pl. 377, fig. 4; JORDAN and SEALE, Proc. U. S. Nat. Mus. 28 (1905) 789; Bull. Bur. Fisheries 26 (1906) 33; WEBER, Fische Siboga Exped. (1913) 309; AHL, Chaetodontidae, 18, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chaetodon oligacanthus BLEEKER, Nat. & Gen. Arch. Ned. Ind. 2 (1845) 520; GÜNTHER, Cat. Fishes 2 (1860) 34, 516; DAY, Fishes of India (1878) 109; MEYER, Ann., Soc. España Hist. Nat. 14 (1885) 17.

Dorsal VI, 28 or 29; anal III, 18 to 20; there are 45 scales in a lateral series, 15 or 16 between the lateral line and the origin of dorsal, and 22 or 23 between the lateral line and the origin of anal.

The compressed body very deep, its depth 1.3 to 1.4 times in its length, the back very much elevated and highest at about base of anterior dorsal rays, the nape convex; the head shorter than deep, 3.1 to 3.4 times in length of body, its upper profile very steep and nearly straight; the depth of caudal peduncle 6.7 to 7.9 times in length of body; the strongly convex interorbital 2.7 to 3.2 times in head and approximately as wide as the length of the bluntly pointed snout, which is contained from 2.7 to 3.1 times; the eye small and rounded, its diameter 2.7 to 3.3 times in length of head; the maxillary very short and contained 3.3 to 3.8 times in head; the width of preorbital behind maxillary greater than half the eye diameter; the mouth very small and very slightly oblique; the jaws equal; two nostrils close together in front of each eye, the anterior one circular and having a high fleshy flap behind, the other an elongate slit which is nearly vertical; the preopercle coarsely serrated below and at the angle.

The scales on side of body moderately small, those covering head, vertical fins, and caudal very small; the lateral line

is slightly arched and terminates below base of eighth dorsal ray from the last; the dorsal spines increase in height posteriorly, the last one about as long as head and 2.1 to 2.6 times in depth of body; the third anal spine highest, 3.6 to 5.4 times in depth of body; the dorsal and anal rays evenly graduated to the last which is lowest; the caudal fin truncate; the pectoral fin small and about as long as ventral spine, its tip above anus; the ventrals are produced into a point and extend to base of anal spines.

In alcohol the ground color is yellowish; a brown, dark-edged ocular band, which is narrower than the eye, descends from neck to breast; three brown bands, darkest at the margins, cross trunk obliquely forward and upward, the first one descending from origin of dorsal to belly, touching in front the hind portion of opercle; the second band runs from posterior dorsal spines to base of anal spines; the third band broadest, extending from anterior dorsal rays to anterior anal rays; a black rounded spot, edged with white, in the last band near base of fifth to ninth dorsal rays; both soft dorsal and anal yellowish at tips, their posterior portions brown near base, this brown color connected in front with the last brown band that crosses body; the caudal peduncle crossed by a wide vertical brown band; this has in front and behind near the edge a narrow transverse white line, bent outwardly; the pectoral, ventral, and caudal fins yellowish, the last one having a dusky edge.

Here described from twenty specimens, 34 to 105 millimeters long, from the following localities: Polillo Island and Lucena, Tayabas; Calapan, Mindoro; Estancia, Panay; Buenavista, Guimaras Island; Calbayog, Samar; and Tagbilaran, Bohol.

This species has been recorded previously in the Philippines by Günther from a half-grown specimen labeled "Philippine Islands," by Meyer from Cebu as *Chætodon oligacanthus*, and by Jordan and Seale from Negros Island and from Cavite. It is found from India through the East Indies to Waigiou, and north to the southern coast of China.

This fish is easily recognized by the form of the dorsal fin, by the transverse bands, and by the black ocellus at base of dorsal.

Genus CHÆTODON (Artedi) Linnæus

Chætodon ARTEDI, Genera (1738) 51 (nonbinomial); LINNÆUS, Syst. Nat. ed. 10 1 (1758) 272 (includes all known Chætodontidæ); CUVIER, Règne Anim. ed. 2 (1829) 189 (first restriction); AHL, Chaetodontidae, 44, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5. *Tetragonopterus* KLEIN, Hist. Piscium (1744) 37 (nonbinomial).

- Rabdophorus* SWAINSON, Class. Fishes 2 (1839) 21 (scales on lower half in nearly horizontal series; scales about 45).
- Megaprotodon* GUICHENOT, Rev. Zool. 11 (1848) 12; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 336 (anal spines 4; scales large, 23 to 25, in oblique rows meeting at right angles).
- Citharædus* KAUP, Wiegmann's Archiv für Naturg. 26¹ (1860) 136 (scales on lower half in horizontal series; scales about 50).
- Linophora* KAUP, Wiegmann's Archiv für Naturg. 26¹ (1860) 137 (scales in series running downward and backward).
- Sarathrodus* GILL, Proc. Acad. Nat. Sci. Phila. (1862) 238.
- Tholichthys* GÜNTHER, Ann. & Mag. Nat. Hist. IV 1 (1868) 457 (larval form).
- Tetragonopterus* BLEEKER, Arch. Neerl. Sci. Nat. 11 (1876) 305 (scales below in horizontal series; spinous dorsal not more than half the length of the soft).
- Chaetodontops* BLEEKER, Arch. Neerl. Sci. Nat. 11 (1876) 305 (scales below in ascending series).
- Lepidochætodon* BLEEKER, Arch. Neerl. Sci. Nat. 11 (1876) 306 (anterior scales much enlarged).
- Oxychætodon* BLEEKER, Arch. Neerl. Sci. Nat. 11 (1876) 306 (scales very large, 24 to 28, the snout pointed).
- Gonochætodon* BLEEKER, Arch. Neerl. Sci. Nat. 11 (1876) 306.
- Hemichætodon* BLEEKER, Versl. Akad. Amsterdam (2) 10 (1876) 313 (scales below running downward and backward, forming an angle with those above).

Common names.—English, butterfly fish; Bicol, *kolibangbang*; Tagalog, *dalagang bukid*, *paro-paro*; Tao Sug and Samal, *bebang*, *isda kaba kaba*; Visayan, *alibangbang*, *tapay tapay*.

The body short, deep, very strongly compressed, especially above and behind; the small compressed head covered with scales almost everywhere; the mouth very small, terminal, the jaws with long, slender, flexible, bristlelike teeth; the preopercle entire or nearly so, without a spine; the dorsal fin usually has 12 or 13 spines, less often 11 or 14; the soft portion usually has its last rays rapidly shortened, but in some species they may be filamentous; the caudal peduncle short, the fin fan-shaped; the anal similar to soft dorsal, with 3, very rarely 4, strong spines; the body covered with ctenoid scales somewhat irregularly arranged, 24 to 54 in lateral series, those on head and vertical fins much smaller; the lateral line curved, high, more or less parallel with back, terminating at posterior extremity of soft dorsal; gill openings rather narrow, the membranes narrowly joined to the isthmus; branchiostegals 6.

Many attempts have been made to subdivide this large genus of typical coral-reef fishes, but none has been very successful. We are therefore grouping under one head all the subgenera

listed above. The members of this genus occur from the east coast of Africa eastward to America, north to Japan and Hawaii, and along the eastern coast of both Americas. Most of them are remarkable for their beauty of color, and in very many languages are called butterfly fishes.

They apparently rely upon their quickness of movement to protect them from their enemies which cannot follow them into the crevices and openings of the coral. Their great depth and strong spines are likewise sufficient to protect them against most coral-reef dwellers. They feed upon minute crustaceans, worms, and other very small animals, and probably to some extent on algæ. There is no more entrancing sight than the unexpected irruption of a swarm of gorgeous chætodonts into a deep dark chasm in the reef. They flit about in the open space, illuminating the depths, only to vanish at a sign of danger into the hidden byways and crevices of the coral.

Artificial key to the Philippine species of Chætodon.

- a*¹. *Megaprotodon*: Anal spines 4; dorsal spines 14; scales large, in oblique series, meeting at right angles; soft dorsal and anal elongate, with concave posterior margin; the outer row of teeth longer than the inner *C. strigangulus*.
- a*². Anal spines 3 (in one species 4); posterior margin of soft dorsal and anal perpendicular or rounded; dorsal spines 11 to 14.
 - b*¹. *Gonochætodon*: Body very deep, dorsal spines 11, the posterior margin of dorsal and anal nearly vertical; scales irregular; sides with nearly vertical stripes, each obtusely angled along median axis, the angle pointing forward..... *C. triangulum*.
 - b*². *Chætodon*: Body not angulate striped as above; scales below lateral line in horizontal rows or obliquely upward or downward.
 - c*¹. Anal spines 4; scales medium, in longitudinal rows below lateral line *C. plebeius*.
 - c*². Anal spines 3.
 - d*¹. *Linophora*: Anterior rows of scales running upward and backward, each marked by a dark line; posterior rows running downward and backward almost at right angles with anterior rows.
 - e*¹. Fifth and sixth dorsal rays produced into an elongate thread *C. auriga*.
 - e*². No produced dorsal rays; a broad black band across base of dorsal to middle of anal base; two black crossbands on caudal *C. vagabundus*.
 - d*². Scales not marked by lines meeting at an angle.
 - f*. Scales large, arranged in very distinct checkerboardlike rows, running both upward and backward and downward and backward.
 - g*¹. No ocular band; a black saddle across interorbital, not reaching eye *C. argentatus*.

- g*². An ocular band present.
- h*¹. Dorsal spines 12; sides checkered with brownish violet streaks following rows of scales; soft dorsal and anal with a narrow blackish submarginal line.... *C. chrysurus*.
- h*². Dorsal spines 13 or 14; a black band on soft dorsal and a black lunate band on caudal..... *C. rafflesi*.
- f*². Scales not in checkerboard arrangement.
- i*¹. Dorsal spines 11.
- j*¹. A black ocellus from third to seventh dorsal rays; dorsal rays 22; anal rays 19..... *C. modestus*.
- j*². Eight blackish brown transverse bands; dorsal rays 18 to 20; anal rays 16 or 17..... *C. octofasciatus*.
- i*². Dorsal spines 12 or more.
- k*¹. Dorsal spines 12.
- l*¹. A black preopercular band or bar present.
- m*¹. Ocular band with a broad white band before and behind it; a deep green or violet stripe running upward and backward between the rows of scales on side *C. collare*.
- m*². A black preocular band behind mouth from snout to chin; 6 or 7 broad orange or brownish diagonal bands running upward and backward on each side *C. ornatissimus*.
- l*². No black preocular band present.
- n*¹. Upper part of body brownish black, inclosing one or two small whitish blotches, rarely none; sides with a row of blackish spots on each scale, running upward and backward..... *C. melanotus*.
- n*². Upper part of body not brownish black.
- o*¹. Body with vertical bands, stripes, or lines.
- p*¹. Two broad blackish vertical bands and about sixteen almost vertical blackish lines on each side of trunk *C. ulietensis*.
- p*². Body with fine vertical lines along posterior margins of scale rows; a broad blackish band along soft dorsal base, across caudal peduncle, and on to posterior part of anal.
- C. lineolatus*.
- o*². Body with oblique lines or bands running downward and forward on sides.
- q*¹. No basal black band on soft dorsal and caudal peduncle.
- r*¹. Ocular band very wide, not uniting above with its fellow; a very small black saddle mark on nape *C. adiergastos*.
- r*². Ocular band uniting above eye with its fellow; a large black wedge-shaped spot on nape and shoulder..... *C. bella-maris*.
- q*². A black band at base of soft dorsal and on caudal peduncle.

- s*¹. Black band not extending upon anal; a broad white band behind ocular band; region between pectoral and spinous dorsal black, with 3 yellow or white converging bands in it. *C. fasciatus*.
- s*². Black crescentic band descending to middle of anal; no white band behind ocular band; anterior dorsal region of body with a spot on each scale, red or golden in life, whitish in alcohol *C. selene*.
- k*². Dorsal spines more than 12.
- t*¹. Dorsal spines 13.
- u*¹. No ocular band; a broad blackish band from middle of spinous dorsal back over soft dorsal, caudal peduncle, and anal; a narrow white edge on soft dorsal and anal *C. carens*.
- u*². An ocular band present.
- v*¹. Fifth dorsal ray elongate, filiform; ocular band faint; upper posterior dorsal region covered by a very large, white-edged black spot. *C. ephippium*.
- v*². None of the dorsal rays elongate and threadlike.
- w*¹. A wide vertical brown band on anterior part of trunk; posterior part brownish with scattered pearly spots; sometimes with 14 dorsal spines. *C. kleini*.
- w*². Body without a wide vertical band anteriorly.
- x*¹. Each scale on body with a basal olive spot; seven nearly vertical bands on side of body. *C. punctato-fasciatus*.
- x*². No vertical bands on trunk.
- y*¹. A large circular black spot on lateral line below posterior dorsal spines; sometimes a wedge-shaped area extends downward from lateral spot *C. unimaculatus*.
- y*². Body with many violet or brown parallel or slightly oblique streaks; a dark band on base of dorsal, anal, and across middle of caudal *C. trifasciatus*.
- z*¹. Dorsal spines 14.
- z*¹. A large black spot on each side of body.
- aa*¹. A circular, white-margined, black ocellus on lateral line below posterior dorsal spines; two oblique pearl bands from opercle toward anal, one above and one below pectoral *C. bennetti*.
- aa*². A black ovate spot about the size of head on lateral line below middle of dorsal; no conspicuous lateral bands *C. speculum*.
- z*². No large lateral spot; body yellowish, a blue spot on each scale; anal with wide black margin; other fins plain *C. citrinellus*.

Subgenus MEGAPROTODON Guichenot

Megaprotodon GUICHENOT, Rev. Zool. 11 (1848) 12; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 336.

This group is distinguished by always having four anal spines instead of three, and by the scales on the body being large and arranged in oblique series which meet at right angles. The oblong body laterally compressed, with the soft dorsal and anal elongated and with concave posterior margin; the snout neither tubulate nor elongate; the outer teeth of lower jaw slightly longer than the inner teeth.

Species few, occurring from the Red Sea to the islands of Polynesia.

CHÆTODON (MEGAPROTODON) STRIGANGULUS (Solander). Plate 4, fig. 1.

Chætodon strigangulus Solander apud GMELIN, Syst. Nat. ed. 13 (1788) 1269; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 52, pl. 172; BENNETT, Zoology Beechey's Voyage, Fishes (1839) 60, pl. 17, fig. 2; GÜNTHER, Cat. Fishes 2 (1860) 4; Fische der Südsee 1 (1873) 35, pl. 26, fig. A; WEBER, Fische Siboga Exped. (1913) 308; AHL, Chaetodontidae, 179, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Megaprotodon strigangulus BLEEKER, Atlas Ichthy. 9 (1878) 54, pl. 375, fig. 1.

Chætodon trifascialis QUOY and GAIMARD, Zool. Voy. Uranie 2 (1824) 379, pl. 62, fig. 5.

Chætodon taunay QUOY and GAIMARD, Zool. Voy. Uranie 2 (1824) 379, pl. 62, fig. 5; GÜNTHER, Cat. Fishes 2 (1860) 5.

Chætodon triangularis RÜPPELL, Atlas Reise Nördl. Afrika, Fische des Rothen Meers (1828) 42, pl. 9, fig. 3.

Chætodon leachii CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 37; GÜNTHER, Cat. Fishes 2 (1860) 6.

Chætodon bifascialis CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 37.

Megaprotodon trifascialis JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 336.

Dorsal XIV, 15 or 16; anal IV, 15; there are 23 to 25 scales in a lateral series, 9 between the lateral line and the origin of dorsal, and 14 between the lateral line and the origin of anal.

The depth of the compressed, oblong-oval body contained 2 to 2.2 times in the length, the back a little more elevated than the ventral; the head nearly as long as deep, being 3.1 to 3.4 times in length of body, its upper profile nearly straight in the large specimen and a little concave in front of eyes; the caudal peduncle deeper than long, 9.1 to 9.2 times in length of body or 4.1 to 4.6 times in depth; the evenly convex interorbital 3 to 3.1

times in length of head; the large circular eye in middle of head, its diameter as long as the pointed snout, which is contained 2.8 times in head; the maxillary 3.7 to 4.3 times in head and slightly longer than width of preorbital, which is contained 4.5 to 4.8 times; the mouth small, its gape slightly oblique, lower jaw slightly in advance of upper; the two nostrils in front of each eye very close together, the anterior one circular and having a high fleshy flap behind, the other simple, oval and slightly oblique; the inferior and posterior edges of preopercle serrated.

The scales on sides of trunk large, arranged in strongly oblique series forward and upward, those on head and fins small to minute; the lateral line is very slightly arched and in our specimens ends on the third or fourth scale before the axil of the soft dorsal, to which it sometimes extends; the dorsal spines evenly graduated to the last, which is 1.3 times in head; the fourth anal spine as long as second and third and 1.2 times in head; the soft dorsal acutely angular, the angle of anal slightly rounded; the caudal fin a little convex, the pectoral small and pointed above, extending to within two scales before vertical through anus; the ventral does not quite extend to anus, its spine 1.6 to 1.7 times in head.

The ground color in alcohol yellowish brown above and yellowish below; the body has about twenty narrow blackish or grayish blue, V-shaped cross stripes, the angles bent toward head, their centers on a line between eye and middle of caudal peduncle; on each side of body two oblong whitish blotches, one on anterior and one on posterior half; a white-edged, blackish ocular band, about as wide as eye, descends from back of neck to anterior portion of breast; the caudal fin is black and has a narrow, submarginal, black crossband bordered on each side with yellowish; the soft vertical fins narrowly edged with whitish and provided with a narrow submarginal black line; the pectoral yellowish and the ventral whitish.

The two examples above described are 67 and 81.5 millimeters in length and were collected at Calapan, Mindoro, and Taba-gaan Island, Sulu Archipelago.

This species, which has not been hitherto recorded from the Philippines, is known to occur from the Red Sea to Guam and Samoa.

Subgenus *GONCHÆTODON* Bleeker

Gonochætodon BLEEKER, Syst. Percarum revisum, Arch. Neerl. Sci. Nat. 11 (1876) 306.

The snout short, pointed, the body very deep and rhomboid; the posterior margin of dorsal and anal fins nearly vertical; the scales on sides in irregular series; sides with alternating lighter and darker, very distinct vertical stripes, each obtusely angled along median axis, the angle pointing forward; 11 dorsal spines, the soft dorsal angulate; anal spines 3, the fin round-angled.

Only one species of this subgenus is known.

CHAETODON (GONOCHAETODON) TRIANGULUM (Kuhl and Van Hasselt). Plate 5, fig. 1.

Chaetodon triangulum Kuhl and Van Hasselt in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 34; AHL, Chaetodontidae, 174, in Archiv für Naturg. 89 (1923) Abt. A, Heft. 5.

Gonochaetodon triangulum JORDAN and SEALE, Bull. Bur. Fisheries 26 (1907) 33; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 269.

Tetragonopterus triangulum BLEEKER, Atlas Ichth. 9 (1878) 53, pl. 374, fig. 1.

Chaetodon baronessa CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 34; GÜNTHER, Cat. Fishes 2 (1860) 31.

Dorsal XI, 24 to 27; anal III, 21 to 23; there are 30 to 32 scales in a lateral series, 9 to 11 between the lateral line and the origin of dorsal, and 9 to 11 between the lateral line and the origin of anal.

The strongly compressed body very deep and nearly circular, depth 1.3 to 1.4 times in length; the head, which is slightly shorter than deep, contained from 3 to 3.4 times in length of body, its dorsal profile in front of eye markedly concave and above eye very steep; the depth of the strongly compressed and short caudal peduncle 8.1 to 8.9 times in length of body; the moderately convex and narrow interorbital contained from 3.2 to 3.8 times in head; the small circular eye nearer to tip of snout than to vertical through posterior edge of opercle, its diameter longer than width of interorbital and 2.7 to 3.2 times in head; the snout rather produced, short, conical, 2.9 to 3.1 times in length of head; the short maxillary 3.5 to 4.3 times in head, as long as or slightly longer than width of preorbital which is about two-thirds the eye; the mouth very small and oblique, the jaws even; there are two nostrils close together in front of each eye, the more anterior circular and having a fleshy rim, the posterior portion very high, the other an oblique streak pointing upward and backward; the preopercle serrated.

The scales on each side of trunk moderate in size and in regularly oblique series, those on head, vertical fins, and caudal

small to minute; the evenly and moderately arched lateral line terminates below base of the middle portion of the rayed dorsal fin or at about the ninth to the twelfth scale from axil of fin; the dorsal spines increase in height posteriorly, the last one being 2.3 to 3 times in depth of body, the third anal spine slightly lower and contained 2.6 to 3.2 times; the soft portions of dorsal and anal highly elevated, the latter more broadly rounded; the caudal fin slightly convex; the pectoral fin a little shorter than head and about as long as last dorsal spine, its tip above anus; the ventral fin extends to origin of anal, its spine 3.4 to 3.7 times in depth of body.

The sides of body have alternating lighter and darker stripes, which are angularly bent with the angle pointing forward, the lighter stripes becoming narrower posteriorly. In life the lighter stripes bright lemon yellow, the darker ones across head deep violet-brown, and those on trunk lilac to blackish brown posteriorly and upon the fins; the lips reddish; the dorsal spines pinkish near base and reddish on their outward portions; the soft dorsal is edged with blackish and has a submarginal band of lilac, which fades in front into the pinkish portion of spinous dorsal, the lilac submarginal band bordered on inner side by a narrow blackish line; the rayed anal is edged with bright lemon yellow and has a submarginal black line; the blackish brown areas on the soft vertical fins fade into reddish outwardly; the membranes of the anal spines reddish and narrowly edged with bluish; the blackish brown caudal is edged with grayish and has a submarginal band of yellowish, this band bordered in front with blackish; both pectoral and ventral fins bright lemon yellow; caudal peduncle has a narrow vertical band of like color which extends upon anal. In alcohol, the lemon yellow areas on head, trunk, and fins have become whitish to very light yellowish, the darker stripes have turned into very light lilac to blackish; the reddish color on lips and vertical fins has faded into yellowish; the blackish markings have become lighter.

We have examined numerous specimens of this species in the Bureau of Science collection, the largest 96 millimeters in length. They were collected at the following localities: Marican Island, Batangas; Calapan, Mindoro; Capul Island, Samar; Gigantangan Island, Leyte; Quiminatin Island, Cuyo Islands; Balabac Island; and Tubigan Island, Sulu Archipelago.

This fish is rather abundant in Calapan, Mindoro, where most of the examples were collected. There are living specimens in the Bureau of Science aquarium. It has been recorded previously

from the Philippines, either Manila or Iloilo, by Jordan and Seale, and by Jordan and Richardson from Cagayancillo. This species is abundant from Sumatra to New Guinea. We follow Ahl in separating the Red Sea forms described as *C. larvatus* and *C. karraf*, and often included with the present species.

CHAETODON PLEBEIUS Broussonet. Plate 6, fig. 1.

Chaetodon plebeius Broussonet in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 52.

Chaetodon plebejus GÜNTHER, Cat. Fishes 2 (1860) 5; Fische der Südsee 1 (1873) 35, pl. 32, fig. B; DAY, Fishes of India (1878) 104, pl. 26, fig. 3; STEINDACHNER, Sitzungsber. Akad. Wiss. Wien 102 (1893) 227; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) 345; AHL, Chaetodontidae, 54, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Dorsal XIII, 18; anal IV, 15; there are 36 scales in the lateral line, 7 between the lateral line and the origin of first dorsal, and 14 between the lateral line and the origin of anal. According to Ahl, the dorsal is XIV, 17 to 19; anal IV to V, 15 to 17.

The oblong-ovate body moderately thick anteriorly, strongly compressed posteriorly; the dorsal and ventral anterior profiles similar, the upper one forming nearly a straight line from dorsal to tip of snout, the ventral profile a little more convex; the greatest depth 1.7 times, the head 3.3 times in length; the short blunt snout equals the circular eye and is 3.5 times in head; the lightly convex interorbital a little more than eye, 3 times in head; the preoperculum practically smooth, with a few microscopic denticulations on lower limb; the mouth small, horizontal, the jaws equal, the short maxillary 3.8 times in head; the nostrils small, close together, nearly circular, a little above median axis of eye, the anterior one with a small posterior valve; the least width of preorbital 4.7 times in head, 1.3 times in eye; the least depth of caudal peduncle greater than its own length and 9.7 times in body length, 2.9 times in head.

The scales on body of medium size, in longitudinal rows except on upper part, where they are arched; they are smaller posteriorly, small to very small on fins and head; the arched lateral line extends back as far as posterior extremity of soft dorsal; the sixth dorsal spine is highest and equals second and third anal spines and ventral spine, 1.6 times in head; the soft dorsal rounded behind, the anal gently angulate; the caudal diagonally truncate, the upper part more elongate than the lower; the pectoral 1.3 times in head.

The color in life clear bright lemon yellow all over, including the fins, except the pectoral and posterior part of caudal, with a longitudinal line of golden yellow along middle of each row of scales; near the dorsal the rows become brown or umber; around mouth and pectoral base the color is orange to reddish orange; on upper part of side, along and below lateral line, is a very large, elongate, oval, violet-black spot with vaguely defined boundaries, extending from the fifth scale of the lateral line to the twenty-eighth; it is more than one and a half times as long as head and its greatest depth is one and a half times eye; on caudal peduncle is a large, deep black, oval spot; a violet blackish brown ocular band with violet-blue margins, and narrower than eye, passes down each side from nape to throat; the two ocular bands do not meet on nape, and each is broken by a golden spot a little way below its origin; the pectoral and posterior part of caudal clear, the ventrals bright yellow anteriorly, the rest colorless.

In alcohol the colors are a little changed, the longitudinal stripes darker, the brilliance of the yellow color dimmed; the posterior margin of both anal and soft dorsal colorless.

Here described from a specimen, 116 millimeters long, collected on the coast of Tablas.

This beautiful and unique *Chaetodon* is apparently very rare. For a long time it was known only from Broussonet's type specimen in the British Museum. Sir Francis Day collected it in the Andamans and Steindachner received nineteen specimens from Fiji. Ahl examined a specimen from Fiji and one from New Guinea. The only figure hitherto published is from a drawing made by Andrew Garrett. Neither his painting nor Broussonet's type showed the lateral elongate blotch.

In the character of the anal spines this handsome fish belongs with *Megaprotodon*, but it differs strongly in the arrangement of the scales and the shape of the body.

CHAETODON AURIGA Forskål. Plate 7, fig. 2.

Chaetodon auriga FORSKÅL, Descrip. Anim. (1775) 60; GÜNTHER, Cat. Fishes 2 (1860) 7; DAY, Fishes of India (1878) 106, pl. 27, fig. 3 (var. *setifer*); VAILLANT, Nouv. Arch. Mus. Paris III 5 (1893) 58 (var. *setifer*); EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1907) 96; AHL, Chaetodontidae, 147, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chaetodon setifer BLOCH, Ichtyologie 12 (1797) 99, pl. 425, fig. 1; LESSON, Voy. Coquille, Zoologie 2 (1830) 175, pl. 29, fig. 2 (1826); GÜNTHER, Cat. Fishes 2 (1860) 6; Fische der Südsee 1 (1873) 36,

pl. 26, fig. B; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 269.

Tetragonopterus auriga BLEEKER, Atlas Ichthy. 9 (1878) 47, pl. 373, fig. 4.

Chætodon sebanus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 57.

Dorsal XIII, 23 to 25; anal III, 20 or 21; there are 20 scales in a lateral series, 8 between the lateral line and the origin of dorsal, and 15 to 17 between the lateral line and the origin of anal.

The body very deep and strongly compressed, its depth contained from 1.6 to 1.7 times in length, the back much elevated and very trenchant; the head longer than deep, 2.7 to 3 times in length of body, its upper profile markedly concave; the caudal peduncle much deeper than long, its least depth 8.6 to 9.1 in length of body; the broad convex interorbital 3.5 to 4 times in length of head, and approximately as wide as the diameter of the circular eye, which is contained from 3.5 to 3.9 times; the eye superior and midway in head; the produced and pointed snout rather long, 2.3 to 2.6 times in head; the maxillary 3.4 to 3.9 times in head; the preorbital nearly as wide as eye and 3.4 to 4 times in head; the very small mouth is nearly horizontal, with the jaws equal; in front of each eye are two small nostrils, the anterior one circular and provided with a high fleshy flap on its posterior border, the other a simple, slightly oblique slit; the preopercle indistinctly serrated behind and below.

The scales on each side of body very large and in regular, very oblique series, those on head, vertical fins, and caudal peduncle becoming very small; the lateral line is very high and convex, and does not quite reach to base of last dorsal rays; the dorsal spines increase in height posteriorly, the last one 1.4 to 1.6 times in length of head; the third anal spine a little higher than second and 1.4 to 1.8 times in head; the soft dorsal forms an angle in the middle, the fifth and sixth rays longest and produced into a more or less elongated thread; the soft anal rounded, the caudal truncate; the pectoral shorter than head and 2.1 to 2.4 times in depth of body, reaching to within two scales of a perpendicular from anus; the pointed ventral does not extend to anus, its spine 1.8 to 2.1 times in head.

In life the general color is pearl gray in front and below, including ventrals, with a faint tinge of violet, changing abruptly to deep orange yellow behind and on vertical and caudal fins; on each side of body behind head is a series of five violet-

gray lines running upward and backward to base of dorsal spines; at right angles to these are ten or twelve similar lines running from the last line downward and backward toward anal; a broad, white-edged black vertical band, narrowing and sometimes, with age, disappearing above, passes through eye and meets the opposite one below; the lips pinkish; the soft dorsal is edged with black and has a large rounded black spot near margin; the anal is yellowish on its outer edge and has a narrow submarginal band of black; the caudal fin is broadly tipped with light violet and has two fine submarginal lines of blackish; the pectoral grayish.

In alcohol the color of body almost uniformly yellowish brown, with five deep brown or blackish lines or bars running obliquely upward and backward behind head; at right angles to posterior one are ten or twelve lines or bars extending down and back to belly and on anal; the ocular band, the large rounded spot on soft dorsal, and the narrow edge to the soft dorsal are black; the submarginal lines on anal and caudal fins blackish.

This description is based upon the following specimens, ranging in length from 19 to 137 millimeters. They are from the following localities:

Currimaos, Ilocos Norte, 2.
Luna and Balaoan, La Union, 4.
Mariveles, Bataan, a ripe female, 124 millimeters long, collected April 24, 1922.
Aloneros, Tayabas, 1.
Batangas Province, a ripe female, 137 millimeters long, collected March 15, 1925.
Calapan, Mindoro, 56.

Elefante Island, Marinduque, 1.
Simara Island, Romblon Province, 1.
Capul Island, Samar Province, 1.
Canigaran, Palawan, 1.
San Juan, Siquijor, 1.
Zamboanga, Mindanao, 1.
Tawitawi, Bilatan, and Sibutu Islands, Sulu Archipelago, 7.

This common species has been recorded previously in the Philippines by Vaillant from Palawan, and by Jordan and Richardson from Cagayancillo. It is very common throughout the tropical Indo-Pacific region from the Red Sea to the Samoan and Hawaiian Islands, and northward to the Riu Kiu Archipelago.

The species appears closely related to *Chætodon vagabundus* Linnaeus, from which it differs in having only five grayish lines running obliquely forward from base of spinous dorsal toward nape, and in the absence of the broad black vertical bands crossing caudal and the soft vertical fins.

According to Ahl our fish is the subspecies *setifer*, the subspecies *auriga* occurring only in the Red Sea.

CHÆTODON VAGABUNDUS Linnæus. Plate 5, fig. 2.

Chætodon vagabundus LINNÆUS, Syst. Nat. 1 (1758) 465; BLOCH, Ichtyologie 7 (1788) 64, pl. 204, fig. 2; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 38; GÜNTHER, Cat. Fishes 2 (1860) 25; DAY, Fishes of India (1878) 105, pl. 27, fig. 1; MEYER, Ann., Soc. España Hist. Nat. 14 (1885) 17; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1906) (1907) 96; AHL, Chaetodontidae, 153, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus vagabundus BLEEKER, Atlas Ichth. 9 (1878) 48, pl. 378, fig. 1.

Chætodon nesogallicus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 48, young; GÜNTHER, Cat. Fishes 2 (1860) 10.

Dorsal XIII, 22 to 26; anal III, 19 to 21; there are 30 to 35 scales in a lateral series, 6 between the lateral line and the origin of dorsal, and 16 between the lateral line and the origin of anal.

The body deep and strongly compressed, the back very much elevated, the depth 1.5 to 1.7 times in length; the head rather small, about as long as deep, 3 to 3.4 times in length of body, its upper profile very steep and slightly arched; the depth of the small caudal peduncle 8.5 to 9.7 times in length of body; the interorbital space slightly convex and contained from 3.2 to 3.7 times in head; the diameter of the circular eye longer than width of interorbital and from 2.8 to 3.1 times in head; the snout a little produced and pointed, 2.6 to 2.8 times in length of head and longer than maxillary, which is contained 3.5 to 3.9 times; the width of preorbital behind maxillary more than two-thirds the length of eye; the mouth rather small, with the jaws even; two nostrils close together in front of each eye, the anterior one circular and provided with a fleshy rim, the posterior portion of which is a high flap, the other nostril an oblique slit; the hind and lower edges of preopercle finely serrated.

The scales on side of body very large, becoming very small on the soft vertical fins and on caudal; the lateral line is strongly arched and extends to below base of posterior dorsal spines; the posterior dorsal spines lower than the middle ones, the last one of the dorsal being 1.3 to 1.7 times in length of head; the second anal spine about as long as third, which is from 1.3 to 1.4 times in head; the soft portions of dorsal and anal obtusely angular; the caudal fin slightly convex; the pectoral about as long as head, longest and pointed superiorly, its posterior end a little before vertical passing through anus; the ventral does not quite reach anus, its spine 1.5 to 1.7 times in length of head.

In life the ground color was straw yellow; the side of the body had six narrow black lines passing downward and forward from base of spinous dorsal toward anterior portion of trunk above pectoral, and the other lines of similar color ran obliquely downward toward anal fin; there was a black ocular band about as wide as eye running across head from origin of dorsal to inferior margin of interopercle; the soft dorsal was bright orange yellow and had a very narrow whitish margin, below which there was a blackish band, broadest toward the highest rays; near its base another black band which curved down across caudal peduncle and continued upon the upper part of anal fin; the anal fin was also bright orange yellow and had a narrow blackish and white margin; the caudal fin was bright orange yellow and had two black crossbands, the more anterior one crescent-shaped, the outer portion of fin colorless; the spinous dorsal, anal, pectoral, and ventral were colored similarly to body.

The ground color has turned into yellowish brown in alcohol, the black bands and lines on head, body, and fins have become deep brown, while the orange yellow of caudal and the soft vertical fins has faded into yellowish.

The above description was taken from a study of thirty-six specimens in the Bureau of Science collection. They measure from 30 to 120 millimeters in length, and were taken at Currimao, Ilocos Norte; Balaoan, La Union; Iba, Zambales; Mariveles, Bataan; Aloneros, Tayabas; Calapan, Mindoro; Gigantangan Island, Leyte; Tagbilaran, Bohol; Clarendon Bay, Balabac; Zamboanga, Mindanao; and Pearl Bank, Basbas, Bungau, Bilatan, Sibutu, and Sitankai Islands, Sulu Archipelago.

This species has been previously recorded in the Philippines from Bacon, Sorsogon, by Evermann and Seale, and elsewhere is known to be very abundant in the East Indies and the South Sea Islands. It ranges from the Red Sea and the east coast of Africa eastward to Samoa and extends northward to Okinawa, Riu Archipelago.

CHÆTODON ARGENTATUS Smith and Radcliffe. Plate 4, fig. 2.

Chætodon argentatus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus. 40 (1911) 319, fig. 1.

Dorsal XIV, 22; anal III, 16; there are 33 scales in a longitudinal series, 4 above and 10 below the lateral line; 22 transverse rows of scales between the opercle and the end of last vertebra.

The general form is nearly rhomboidal, its depth 1.63 in the length, strongly compressed laterally, the small pointed head

deeper than long, 3.12 times in the length, its upper profile slightly concave, and somewhat irregular; the circular eye 3 times in head, the conical snout a little longer, 2.64 in head; the maxillary 3.42 in head, barely reaching a vertical from anterior nostril; the nostrils close to eye, the anterior nostril the larger, circular, with a posterior flap, the posterior nostril elongate and slitlike; the very slightly rounded interorbital 3 times in head; the preopercular border smooth except for a few weak teeth near upper angle and on horizontal margin; the long slender teeth are in bands and have a slight constriction near the top; the slender caudal peduncle shorter than its depth, 3 times in head; the silvery peritoneum has scattered dusky spots.

The scales on middle of trunk larger than the rest, and arranged in very distinct rows, both upward and backward and downward and backward; the head, belly, and vertical fins finely scaled.

The dorsal spines long, slender, the fourth one longest, 1.26 in head, membrane of anterior spines deeply incised; soft dorsal moderately low, evenly rounded; caudal short, obliquely truncate; anal bluntly right-angled, second and third spines subequal, the second slightly stronger than the third; ventrals 1.14, short, tips not reaching vent; pectoral 1.1.

Color in alcohol silvery, tinged with very pale lemon yellow; a narrow black saddle across upper part of interorbital, not reaching eye; a small black area on upper part of eye and adjacent interorbital region; an irregular black saddle from in front of origin of dorsal downward across upper part of opercle, duskiness extending across upper part of preopercle to posterior margin of eye; a black area crossing fifth to ninth dorsal spines and extending downward to middle of side; a broad black band including last dorsal spine and anterior third of soft dorsal extending downward and backward across base of soft dorsal, caudal peduncle, and posterior third of anal; margin of soft dorsal silvery white, the tips of the rays very narrowly edged with black, a narrow inframarginal black line below marginal band, area between this and the broad black band crossing base of fin dusky white; a blackish segment on tips of middle caudal rays; anterior to this a similar white band preceded by a black crescent fading out on base of fin; anterior two-thirds of anal silvery white, posterior third black; dusky or blackish lines extending downward and backward or upward and backward

along the rows of scales, forming a checkerboard arrangement and emphasizing the scale arrangement.

The above description is that of the type, 96 millimeters in length, collected at Agojo Point, Catanduanes Island, off the coast of southeastern Luzon.

Another specimen, 85 millimeters long, taken at Port San Pio V, Camiguin Island, north of Luzon, had no yellow in life; the pale parts were silvery, the darker parts black; the black markings are more pronounced than in the type, the black and white markings of the caudal more distinct; the black saddle on the interorbital is interrupted on the right side.

The above description is taken from that by Smith and Radcliffe, who described the only specimens known, collected by the *Albatross* when in Philippine waters.

CHÆTODON CHRYSURUS Desjardins. Plate 8, fig. 1.

Chætodon chrysurus DESJARDINS, Proc. Zool. Soc. (1833) 117; DAY, Fishes, Fauna Brit. India 2 (1889) 6; AHL, Chaetodontidae, 161, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chætodon xanthurus BLEEKER, Act. Soc. Sci. Indo-Neerl. 2 (1857) 53; GÜNTHER, Cat. Fishes 2 (1860) 29; SAUVAGE, Poissons, in Hist. de Madagascar (1875) 261, pl. 29, fig. 1.

Chætodon mertensi (not Cuvier and Valenciennes) DAY, Fishes of India (1878) 105, pl. 27, fig. 2.

Tetragonopterus mertensi (not Cuvier and Valenciennes) BLEEKER, Atlas Ichth. 9 (1878) 50.

Tetragonopterus xanthurus BLEEKER, Atlas Ichth. 9 (1878) pl. 378, fig. 3.

Dorsal XIII, 22; anal III, 17; there are 29 or 30 scales in a lateral series, 8 between the lateral line and the origin of dorsal, and 14 between the lateral line and the origin of anal.

The body deep and much compressed, with the back very highly elevated; the depth contained 1.8 times in length; the head, which is very slightly shorter than deep, is 3.2 times in length of body, its upper profile steep, and a little concave in front of eye; the moderately wide and convex interorbital as wide as preorbital, which is 3.8 times in head or more than two-thirds eye diameter; the circular eye fairly large and slightly closer to tip of snout than to the point above posterior edge of opercle, its diameter 3.2 times in head; the snout slightly produced, pointed, slightly longer than eye, 2.9 times in head; the maxillary a trifle shorter than eye and 4 times in head; the mouth small and horizontal, the jaws even; the two nostrils close together in front of eye, the anterior one circular and

having a fleshy rim which is highest behind, the posterior one an ovoid and simple opening; the preopercle indistinctly serrated.

The scales on each side of body rather irregular in size, those on spinous dorsal and below it toward belly and anal fin rather large; the scales covering nape, head, breast, caudal, and the soft portions of the vertical fins small to minute; the lateral line is moderately arched and terminates on the fourth scale in front of axil of dorsal fin; the middle dorsal spines about as high as posterior ones, the last 1.4 times in head; the third anal spine as long as pectoral which is 2.1 times in depth of body; the rayed dorsal more broadly rounded than the soft anal; the caudal fin convex; the pectoral is short and does not quite extend to the vertical line passing through anus; the ventral fin reaches base of anal spines, its spine 1.4 times in length of head.

The ground color in alcohol yellowish white; each side of body checkered with oblique brownish violet streaks which cross each other and follow the series of scales; the black ocular band, which is narrower than the eye, edged on both sides with white; a white-edged, horseshoelike black saddle on top of neck; the soft portions of dorsal and anal are narrowly edged with yellowish and have a very narrow blackish submarginal line; the other fins colored similarly to body.

Here described from the only specimen in the Bureau of Science collection. It measures 86 millimeters in length and was obtained at Puerto Galera, Mindoro, in March, 1912.

This species, which is new to the Philippines, occurs from the Red Sea and Madagascar through the seas of India to Sumatra and eastward to New Britain, in the Bismarck Archipelago.

CHÆTODON RAFFLESI Bennett. Plate 6, fig. 2.

Chætodon rafflesii BENNETT, Life of Raffles (1830) 689; GÜNTHER, Cat. Fishes 2 (1860) 27; Fische der Südsee 1 (1877) 44, pl. 35, fig. 2; PETERS, Monatsber. Akad. Wiss. Berlin (1876) 832; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 339; AHL, Chaetodontidae, 158, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5. *Tetragonopterus rafflesii* BLEEKER, Atlas Ichth. 9 (1878) 49, pl. 376, fig. 4.

Chætodon princeps CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 25.

Chætodon sebae CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 40.

Dorsal XIII (rarely XIV), 22 or 23; anal III, 19 or 20; there are 29 or 30 scales in a lateral series, 7 between the lateral line

and the origin of dorsal, and 14 between the lateral line and the origin of anal.

The strongly compressed body very deep, the back very much elevated with the anterior profile from interorbital space to origin of dorsal very steep; the depth of body 1.6 to 1.7 times in length; the head pointed, a little longer than deep, 2.9 to 3.1 times in length of body, its dorsal outline concave, the depth of caudal peduncle contained from 5.2 to 5.8 times in that of body; the interorbital space little convex, 3.5 to 3.9 times in length of head and about as wide as preorbital, which is contained 3.5 to 4.2 times and a little narrower than the circular eye, which is high up, near profile of head and almost midway between tip of snout and posterior edge of opercle; the snout produced, conical, and longer than eye, 2.4 to 2.8 times in length of head; the maxillary short and 3.5 to 3.9 times in head; the mouth small and horizontal, the jaws about even; the two nostrils close together in front of eye, the anterior one circular and provided with a fleshy rim, the other one an oblique slit pointing upward and backward toward upper rim of orbit and having a wide fleshy flap below; the preopercle distinctly serrated at the angle.

The scales large on side of trunk, becoming smaller on head, vertical fins, and caudal; the strongly arched lateral line terminates at the fourth to the sixth scale in front of axil of dorsal fin; the dorsal spines are graduated in height to the last, which is 1.3 to 1.7 times in head; the third anal spine longer than second and about as long as last dorsal; the rayed portions of vertical fins rounded posteriorly; the caudal slightly convex; the pectoral rather broad, shorter than head, and 1.8 to 2.2 times in depth of body, its tip above anus; the ventral fin is pointed and extends to anus, its spine about as long as third anal or last dorsal spine.

In life the ground color is deep lemon yellow; the trunk is checkered with two series of cross streaks on the edges of the scales, which are pinkish brown above and pinkish red below; the forehead grayish; the head bright lemon yellow on each side of the black ocular band, which descends from origin of dorsal to inferior margin of interopercle; the soft dorsal is edged with lemon yellow and has a submarginal band of black, bordered in front with another submarginal band of yellow, which is separated from the lemon yellow color of fin by a reddish area; the anal is lemon yellow at its edge and has a

fine submarginal line of black; within this line the color of the fin changes from orange yellow to bright lemon yellow; the caudal bright lemon yellow, traversed by a black band which is widest along the middle, and edged posteriorly with gray; the pectoral and ventral bright lemon yellow.

In alcohol the ground color varies from yellowish to yellowish brown, becoming darker above toward dorsal; the oblique streaks on each side of body, which cross each other, are gray; black bands on head, caudal, and soft dorsal very distinct, the band on the last fin edged on both sides with yellowish, and the remaining portion grayish; the anal is yellowish at edge and has a blackish submarginal line; the caudal yellowish and edged with grayish behind; both pectoral and ventrals yellowish.

There are twenty-four examples in the Bureau of Science collection, which were obtained at the following localities: Aloneros, Tayabas; Calapan, Mindoro; Tagbilaran, Bohol; Canigaran, Palawan; southern coast of Cotabato Province, Mindanao; and Tubigan Island, Sulu Archipelago. One of the three specimens from Aloneros, 114 millimeters in length, is a female about ready to spawn, collected in December, 1925.

This species, which hitherto has not been reported from the Philippines, occurs throughout the East Indies, extending north-eastward to the Pelew Islands and southeast to the Bismarck Archipelago and Fiji.

CHAETODON MODESTUS (Schlegel).

Chaetodon modestus SCHLEGEL, Fauna Jap., Poiss. (1842) 80, pl. 41, fig. 2; GÜNTHER, Cat. Fishes 2 (1860) 10; JORDAN and FOWLER, Proc. U. S. Nat. Mus. 25 (1902) 535; SEALE, Philip. Journ. Sci. § D 9 (1914) 72; AHL, Chaetodontidae, 82, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Coradion modestum JORDAN, TANAKA, and SNYDER, Cat. Fishes Japan, Journ. Coll. Sci. Imp. Univ. Tokyo 23 (1913) 211, fig. 213.

Coradion desmotes JORDAN and FOWLER, Proc. U. S. Nat. Mus. 25 (1902) 539, fig. 5.

Dorsal XI, 22; anal III, 19; there are about 46 scales in a lateral series, 11 between the lateral line and the origin of dorsal, and 27 between the lateral line and the origin of anal.

The body very short, deep, and compressed, the back strongly elevated; the depth contained 1.5 times in length; the pointed head about as long as deep, 2.5 times in length of body and 2.8 times the depth of the short, deep caudal peduncle, its upper profile steep; the convex interorbital as wide as length of maxillary, which is 3.5 times in length of head; the circular

eye rather large and midway between tip of snout and posterior margin of opercle, its diameter 3 times in head or a little shorter than the produced pointed snout, which is contained 2.8 times; the preorbital a little narrower than length of maxillary and a trifle more than two-thirds eye; the mouth small; the small nostrils close together and a little before eye, the front one circular and having a high fleshy flap behind, the other a simple oval opening; the posterior edge of preopercle distinctly serrated.

The scales small on side of body and very small on head, vertical fins, and caudal; the lateral line is strongly arched, nearly concurrent with margin of dorsal, and forms a blunt angle below base of anterior dorsal rays, its posterior end a little in front of axil of dorsal fin; the dorsal spines decrease in height posteriorly from third, which is as long as head; the second anal spine stronger and higher than third, being 1.5 times in head; both soft dorsal and anal very broadly rounded; the caudal fin truncate; the pointed pectoral shorter than head and 1.4 times in depth of body, its tip above origin of anal; the ventral fin is longer than pectoral and extends to base of anal spines, its spine 1.4 times in head.

The ground color in alcohol yellowish brown; a black ocular band about as wide as eye descends from origin of dorsal to inferior margin of interopercle; a narrow black band runs from supraoccipital region to tip of snout; on each side of trunk two rather broad, dark-edged, brown vertical bands, the first one a little shorter than pectoral, descending from the spinous dorsal toward belly; the other one of about equal width from soft dorsal to soft anal; the anterior portion of rayed dorsal has a white-edged black ocellus, which is about the size of eye; the ventrals blackish, both pectoral and caudal fins yellowish brown.

Here described from a single specimen, 35.5 millimeters long, collected by Alvin Seale at Hongkong.

This species is only known to occur in the Chinese and Japanese seas, but may occur among the Batan and Babuyan Islands and along the north coast of Luzon.

CHÆTODON OCTOFASCIATUS Bloch.

Chætodon octofasciatus BLOCH, *Ichtyologie* 6 (1788) 85, pl. 215, fig. 1; CUVIER and VALENCIENNES, *Hist. Nat. Poiss.* 7 (1831) 13; GÜNTHER, *Cat. Fishes* 2 (1860) 17; DAY, *Fishes of India* (1878) 108; EVERMANN and SEALE, *Bull. Bur. Fisheries* 26 (1906) (1907) 96;

AHL, Chaetodontidae, 84, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.
Tetragonoptrus octofasciatus BLEEKER, Atlas Ichthy. 9 (1878) 38, pl. 376, fig. 3.

Dorsal XI, 18 to 20; anal III, 16 or 17; there are 45 to 48 scales in a lateral series, 12 between the lateral line and the origin of dorsal, and 21 between the lateral line and the origin of anal.

The body very deep, strongly compressed and subcircular, the depth 1.3 to 1.5 times in length, the back a little more elevated than the ventral outline; the head shorter than deep, 3.2 to 3.4 times in length of body, its upper profile very steep and nearly straight; the depth of the small caudal peduncle 7.6 to 9.2 times in length of body; the interorbital space strongly and evenly convex, rather broad, 2.7 to 3.1 times in head; the eye circular and moderate in size, 2.5 to 3 times in length of head; the obtuse and bluntly rounded snout 2.8 to 3.1 times in head and longer than maxillary, which is contained 3 to 4.6 times; the width of preorbital behind maxillary 1.4 times in diameter of eye; the mouth small, oblique, the jaws equal; the two nostrils before each eye rounded and close together, the one in front having a fleshy rim, highest around the posterior portion, the nostril behind a simple opening; the preopercle finely serrated behind and below.

The scales on side of body small and in nearly vertical series, those covering head, vertical fins, and caudal very small; the lateral line is moderately arched and terminates at the sixth to the eighth scale in front of axil of dorsal fin; the middle dorsal spines higher than the posterior ones, the second anal spine about as high as the third, which is 2.6 to 3.2 times in head; the soft portions of dorsal and anal very broadly rounded; the caudal fin convex; the short broad pectoral a little shorter than head, being 2.5 to 3.1 times in depth of body and ending above anus; the ventral fin extends to base of first anal spine, its spine 2.7 to 3.2 times in head.

In life the ground color is bright lemon yellow, paler along breast and belly; on each side eight blackish brown transverse bands with wider spaces between second and third, fourth and fifth, sixth and seventh, so that they appear to be arranged in pairs; the first of these bands crosses eye and the last one is on caudal fin; a blackish brown longitudinal band runs from tip of snout to nape of neck; the portion of seventh band which crosses caudal peduncle edged in front and behind with white;

the soft dorsal and anal have a blackish brown band near margin, edged on each side with white; the pectoral and the outward portion of tail pale, the ventral lemon yellow; in younger specimens a large blackish blotch is below the lateral line between the fourth and fifth bands.

In alcohol the ground color is brownish, fading into yellowish on breast and belly; the bands turn to blackish violet.

Here described from twelve specimens, 57 to 78.5 millimeters long, collected at the following places: Sisiman, Bataan Province; Estancia, Panay; and Basbas Island, Sulu Archipelago. The largest of the specimens is a ripe female, collected February 11, 1925. This species has been recorded previously in the Philippines by Evermann and Seale from Bacon, Sorsogon.

This easily recognized fish is known to occur only in the seas of India and the East Indian Archipelago to the Moluccas.

CHAETODON COLLARE Bloch.

Chaetodon collare BLOCH, *Ichthyologie* 6 (1787) 87, pl. 216, fig. 1; CUVIER and VALENCIENNES, *Hist. Nat. Poiss.* 7 (1831) 41; AHL, *Chaetodontidae*, 135, in *Archiv für Naturg.* 89 (1923) Abt. A, Heft 5.

Chaetodon collaris KNER, *Reise Novara, Fische* (1865) 99; SEALE, *Philip. Journ. Sci.* § D 9 (1914) 72.

Tetragonopterus collaris BLEEKER, *Atlas Ichthy.* 9 (1878) 42, pl. 373, fig. 2.

Chaetodon praetextatus CANTOR, *Cat. Malayan Fishes, Journ. Roy. Asiatic Soc. Bengal* 18 (1849) 156, pl. 3; GÜNTHER, *Cat. Fishes* 2 (1860) 22; DAY, *Fishes of India* (1878) 107, pl. 27, fig. 6.

Chaetodon viridis BLEEKER, *Nat. & Gen. Arch. Ned. Ind.* 2 (1845) 520.

Dorsal XII, 26 to 28; anal III, 20 to 22; scales in the lateral line 34 to 38; from the lateral line to the origin of dorsal 6 or 7, to the origin of anal 15 to 18.

The depth of the orbiculate subrhomboid body twice or nearly twice, and the head 4 or nearly 4 times in length; the dorsal profile concave; the eye $2\frac{1}{3}$ to 3 times in head, the interorbital nearly or quite equal to eye; the snout without maxilla shorter than eye; the preorbital smooth, the preopercle not or scarcely denticulate; the anterior lateral scales of medium and nearly uniform size, those posteriorly along middle sensibly smaller; the soft dorsal obtusely rounded, the middle rays longer than the others; the anal also obtusely rounded, shorter than the dorsal rays; the caudal truncate-convex.

The color of body violaceous to yellowish green; the head has two violet-brown to blackish crossbars, one before eye back of mouth, the other an ocular band; they are over a white

background which stands out in strong contrast as white bands between and behind the dark bars; between the rows of scales on the sides is a deep green or violet-green stripe, running obliquely upward and backward; the scales at sides of dorsal and anal bases each with a yellow or golden spot; the spinous dorsal and pectoral yellowish to rosy; the ventrals purple to blackish; the free parts of soft dorsal and anal and basal half of caudal carmine; the soft dorsal has a white, dark-margined, longitudinal stripe; the anal has a white marginal band, its inner side fuscous; the posterior half of caudal has a dark purple crossband, beyond which is a pearly white border, the posterior margin of the fin with a wide yellow band.

The above description is taken from Bleeker. In 1924 a beautiful specimen of this fish was brought from Calapan, Mindoro, and kept alive a long time in the Bureau of Science aquarium. Unfortunately the fish died during our absence from Manila, and the specimen was not preserved.

This species, either the typical form or some of its varieties, occurs from the coast of India to Celebes, and north to China.

CHAETODON ORNATISSIMUS (Solander). Plate 9, fig. 1.

Chaetodon ornatissimus Solander in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 17; GÜNTHER, Cat. Fishes 2 (1860) 15; Fische der Südsee 1 (1873) 38, pl. 30, fig. B; JORDAN and EVERMANN, Bull. U. S. Fish Comm. 23¹ (1903) (1905) 373, pl. 53; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 345; AHL, Chaetodontidae, 51, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5. *Tetragonopterus ornatissimus* BLEEKER, Atlas Ichth. 9 (1878) 32, pl. 375, fig. 2.

Dorsal XII, 25 or 26; anal III, 21; there are about 50 scales in a lateral series, 10 between the lateral line and the origin of dorsal, and 21 or 22 between the lateral line and the origin of anal.

The body very deep, compressed, and contained 1.5 times in length; the head very deep, much deeper than long, its length 3.1 to 3.5 times in length of body, and its upper profile almost straight from tip of snout to origin of dorsal fin; the caudal peduncle much compressed and deeper than long, its depth 8.1 times in length of body or 2.3 times in length of head; the interorbital space broad, strongly convex, as wide as length of maxillary which is contained 2.9 to 3.1 times in head; the eye circular, placed rather high, and located about halfway between tip of snout and posterior edge of opercle, its diameter 3.4 to 3.5 times in head; the snout bluntly rounded, rather

short, 2.7 in head or a little longer than maxillary; the mouth small, with the terminal jaws slightly produced and the lips somewhat thin and broad; the width of preorbital at angle of mouth slightly more than half the eye; the suborbital ring is a little narrower and appears to be adnate to the cheek; the preopercle finely serrated; there are two nostrils, close together, the anterior one circular and provided behind with a fleshy flap, the posterior one oval and slightly oblique; the opercle entire, provided posteriorly with two blunt flat spines.

The scales moderate, in regular horizontal and vertical series, those on vertical fins and top of head very small; the lateral line strongly arched, somewhat angular below anterior third of rayed dorsal and not continued beyond base of last dorsal rays; the dorsal spines increase in height to the last, which is 1.3 to 1.7 times in head; the soft dorsal more rounded than the rayed anal; the caudal fin convex; the pectoral slightly pointed inferiorly, rather short, 3.4 times in length of body and slightly shorter than head, its posterior end above anus; the ventral fin barely extends to anus, with the spine 1.6 to 1.8 times in head or slightly shorter than third anal spine.

The ground color in alcohol yellowish brown, with six broad, oblique, orange or brownish bands on each side of body running upward and backward and alternating with whitish; the head crossed by blackish vertical bands, the anterior two of which are broad, the first one running from snout to chin and the other from above occiput, through eye, to breast; the lower lip broadly blackish; two narrow blackish vertical bands behind eye, one continued from across posterior portion of preopercle up along margin of dorsal to the last dorsal rays, and the other across anterior portion of opercle; a broad band of grayish brown almost wholly covering the interorbital space; the spaces between the blackish bands on head yellowish; the rayed vertical fins narrowly edged with blackish, the anal having a submarginal band of similar color running parallel with margin of fin; two blackish crossbands on caudal fin, which is edged with white posteriorly; both pectoral and ventral fins yellowish.

This large and very handsome fish is here described from five specimens in the Bureau of Science collection, measuring 21 to 114 millimeters in length, three of which are ripe females; one was collected February 15, 1925, at Balinakan, Marinduque, and two were collected March 26, 1926, at Bennett Island, Masbate. The other two specimens were collected at Quiminatin Island, Cuyo Islands. The first record of this species in the

Philippines is by Jordan and Seale, who had one specimen, purchased in the Manila market.

The species is known from the Moluccas to Samoa and Tahiti, northward to Hawaii.

CHÆTODON MELANOTUS Bloch and Schneider. Plate 11, fig. 2.

Chætodon melanotus BLOCH and SCHNEIDER, Syst. Ichth. (1801) 224; GÜNTHER, Fische der Südsee 1 (1873) 44; DAY, Fishes of India (1878) 108, pl. 28, fig. 1; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 341; AHL, Chaetodontidae, 128, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus melanotus BLEEKER, Atlas Ichth. 43 (1878) pl. 376, fig. 1.

Chætodon dorsalis CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 53; RÜPPELL, Atlas, Fische des Rothen Meers (1828) 41, pl. 9, fig. 2; GÜNTHER, Cat. Fishes 2 (1860) 28.

Chætodon marginatus (Ehrenberg) CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 44.

Chætodon abhortani CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 44.

Dorsal XII, 19 or 20; anal III, 17 or 18; there are 36 to 40 scales in a lateral series, 8 or 9 between the lateral line and the origin of dorsal, and 17 between the lateral line and the origin of anal.

The body very deep and strongly compressed, with the dorsal and ventral profiles about equally elevated; the depth contained from 1.6 to 1.7 times in length; the head, which is pointed, is as long as deep, 3.1 to 3.4 times in length of body, its dorsal profile very slightly concave; the depth of caudal peduncle 8.4 to 9.6 times in length of body; the evenly convex interorbital fairly wide, 2.8 to 3.1 times in head; the large circular eye superior and closer to tip of snout than to vertical line through posterior margin of opercle, its diameter 2.8 to 3.4 times in length of head, or shorter than the long pointed snout which is contained 2.7 to 3 times; the maxillary 3.4 to 4.3 times in head, slightly longer than width of maxillary behind it, which is greater than two-thirds eye; the mouth small, its gape horizontal, the jaws about even; the two nostrils in front of each eye are close together, the one in front circular and provided with a fleshy rim which is highest behind, the other a simple slit covered above by an overhanging portion of the skin; the preopercle indistinctly serrated at the angle.

The scales covering the sides are large and in almost vertical series, those on head, vertical fins, and caudal very small; the

lateral line is deeply arched and ends below posterior third of dorsal fin; the fifth and sixth dorsal spines highest, each being 1.3 to 1.5 times in head; the second anal spine higher and stronger than third anal; both rayed dorsal and anal broadly rounded; the caudal truncate; the short broad pectoral is 2 to 2.4 times in depth of body and does not quite extend to above anus; the ventral fin extends almost to anus, its spine 1.2 to 1.7 times in head.

In life the color is bright yellow or bluish gray, with the snout bright lemon yellow; a broad blackish patch covers the whole back and incloses one or two small whitish blotches which may be absent in some specimens; the scales on each side of trunk have dusky rows of blackish spots which run upward and backward, the upper ones forming closely spaced stripes, those below more or less separated; a blackish ocular band, narrower than eye, which runs from nape to breast, is edged with bright yellow on both sides; a large black blotch superiorly on caudal peduncle and a much smaller one, which may be absent in some individuals, exists below; in the young a large black blotch entirely covers caudal peduncle; the spinous dorsal brownish yellow; the soft dorsal blackish brown at base, and bright yellow on the remaining portion, with a submarginal line of black; the anal fin broadly bright yellow, with a clear yellow edge and a submarginal line of black; the caudal is yellow toward base, translucent posteriorly, and has a blackish vertical streak; the pectoral colorless and the ventrals golden yellow.

In alcohol the light areas on head, body, and fins become yellowish brown, with the exception of the pectoral and the outward portions of the soft vertical fins and caudal, which are almost transparent; the dark portions blackish violet.

In the Bureau of Science collection are thirty-one examples which range from 17 to 137 millimeters in length. They were obtained at the following localities:

Mariveles, Bataan, 1.	New Washington, Capiz, 2.
Southern coast of Batangas Province, a ripe female, 126.5 millimeters long, collected March 15, 1925.	Bantayan Island, 1.
Calapan, Mindoro, 8.	Cebu, Cebu, 4.
Tagapula Island, Samar, 1.	Agutaya and Quiminatin Islands, Cuyo Islands, 2.
Gigantangan Island, Leyte, 1.	Zamboanga, Mindanao, 1.
	Sibutu Island, Sulu Archipelago, 10.

The species, which hitherto has not been reported from the Philippines, occurs from the Red Sea and the east coast of

Africa, through the seas of India and East Indies to Fiji and Samoa, extending northward to the coast of China.

CHÆTODON ULIETENSIS Cuvier and Valenciennes.

Chætodon ulietensis CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 30; GÜNTHER, Cat. Fishes 2 (1860) 18; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 340; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1907) 96; AHL, Chaetodontidae, 171, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus ulietensis BLEEKER, Ned. Tijd. Dierk. 1 (1863) 234.

Chætodon falcula (not of Bloch) GÜNTHER, Fische der Südsee 1 (1873) 39, pl. 27, fig. C; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1906) (1907) 96.

Chætodon aurora DE VIS, Proc. Linn. Soc. N. S. Wales 9 (1884) 453.

Dorsal XII, 23; anal III, 20; there are 31 scales in a lateral series, 7 between the lateral line and the origin of dorsal, and 15 between the lateral line and the origin of anal.

The body very deep and much compressed, its depth 1.6 times in length, the back much elevated and evenly arched; the head longer than deep, 2.9 times in length, its upper profile convex; the depth of the short, compressed caudal peduncle 9.3 times in length of body or 5.8 times in its depth; the interorbital evenly convex and rather wide, as wide as the circular eye which is 3.8 times in length of head; the long snout pointed, conical, and 2.2 times in head; the maxillary contained 3.6 times in head; the preorbital wider than eye, 3.2 times in length of head; the mouth small, its gape almost horizontal, jaws equal; the two small nostrils close together in front of eyes, the anterior one circular and provided with a high flap behind, the other a simple slit which is nearly horizontal; both the inferior and the posterior edges of preopercle finely denticulated.

The scales on side of body moderately large and in regular oblique series, those on head and fins becoming very small; the lateral line is slightly arched and ends below anterior third of the rayed dorsal; the dorsal spines moderately high, the last one the highest and contained 1.6 times in head, the third anal spine about as high as last dorsal spine; the soft portions of vertical fins rounded; the caudal a little convex; the pectoral 1.4 times in head, pointed and longest superiorly, its tip a little before vertical passing through anus; the ventral just reaches anus, its spine a little longer than either last dorsal or third anal spine.

In alcohol the ground color yellowish brown; about sixteen almost vertical blackish violet lines on each side of trunk; the

blackish violet ocular band is about as wide as eye and descends from back of nape to lower edge of interopercle; a very broad blackish violet vertical band crosses anterior portion of trunk from anterior half of spinous dorsal to behind pectoral base; a second vertical band on body descends from posterior portion of spinous dorsal and from anterior part of rayed portion to or nearly to anal; the caudal peduncle covered with a blackish violet blotch; a narrow blackish edge on soft dorsal; the caudal has a white and black edge posteriorly; the soft anal has two submarginal blackish lines; the pectoral and ventral fins uniformly yellowish brown.

The Bureau of Science collection has but a single specimen, 126 millimeters long, collected at Olongapo, Zambales. This species, which has been reported in the Philippines from Bacon, Sorsogon, by Evermann and Seale, occurs from the Moluccas eastward throughout the South Sea Islands.

CHAETODON LINEOLATUS Quoy and Gaimard. Plate 10, fig. 2.

Chaetodon lineolatus Quoy and Gaimard in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 31; QUOY and GAIMARD, Voy. Astrolabe (1835) 381; GÜNTHER, Cat. Fishes 2 (1860) 30; Fische der Südsee 1 (1873) 45, pl. 34, fig. A; JORDAN and EVERMANN, Bull. U. S. Fish Comm. 23¹ (1903) (1905) 365, fig. 159; AHL, Chaetodontidae, 167, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chaetodon lunatus Ehrenberg in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 43; RÜPPELL, Neue Wirbelt. Abyssinien, Fische (1835) 30, pl. 9, fig. 3.

Chaetodon oxycephalus BLEEKER, Nat. Tijds. Ned. Ind. 4 (1853) 603; GÜNTHER, Cat. Fishes 2 (1860) 27.

Chaetodon tallii Bleeker, Nat. Tijds. Ned. Ind. 6 (1854) 97; GÜNTHER, Cat. Fishes 2 (1860) 11.

Tetragonopterus lineolatus BLEEKER, Atlas Ichth. 9 (1878) 51, pl. 377, fig. 2.

Dorsal XII, 24 to 27; anal III, 19 to 22; there are 28 to 30 scales in a lateral series, 7 or 8 between the lateral line and the origin of dorsal, and 16 or 17 between the lateral line and the origin of anal.

The body very deep, compressed, its depth 1.5 to 1.7 times in length, its dorsal profile much elevated; the head about as long as deep, 3 to 3.1 times in length of body, the upper profile from tip of snout to origin of dorsal strongly concave; the caudal peduncle very short and deep; its least depth 8.4 to 9.6 times in greatest depth of body; the broad, strongly convex interorbital 3.3 to 3.7 times in length of head, and approximately as wide as the length of maxillary which is contained 3 to 3.5 times; the small circular eye about halfway between tip of

snout and posterior margin of opercle, 3.6 to 4.8 times in head; the snout much produced, somewhat conical and nearly horizontal, its length greater than twice diameter of eye, 2.1 to 3 times in length of head; the width of preorbital behind maxillary slightly greater than that of interorbital, and contained from 3.1 to 3.2 times in head; the mouth small, nearly horizontal, with the slightly produced jaws about even; there are two nostrils, close together in front of each eye, each margined by a fleshy flap, the more anterior small, circular, and with the flap behind rather high, the posterior nostril an oblique slit; the preopercle serrated behind and below.

The scales on sides very large and in regular, very oblique series, those on head, chest, caudal peduncle, and bases of rayed vertical fins becoming smaller, and those covering the soft dorsal and anal very small; the lateral line is very slightly arched and ceases below posterior dorsal spines; the dorsal spines increase in height to the last, which is contained 1.6 to 2 times in length of head as is likewise the third anal spine; both the soft dorsal and anal angular posteriorly; the caudal fin slightly convex; the pectoral, which is pointed and longest superiorly, is 2.3 to 2.7 times in height of body and extends to above anus; the ventral barely reaches anus, its spine is longer than either last dorsal or third anal spine, 1.8 to 2.2 times in head.

The ground color in alcohol varies from yellowish to yellowish brown; the body crossed by fine blackish vertical lines, one along lower posterior margin of each series of scales; a black ocular band, wider than eye, descends from occiput to lower edge of interopercle, crossing side of head; above eye it divides and incloses a triangular light area; in very young examples this light portion forms part of the yellowish area in front of head and in older forms it connects with the ground color of body, dividing the ocular band into two; a broad blackish band, widest anteriorly, extends along base of soft dorsal, across caudal peduncle, and in very large individuals extends to or upon the base of anal rays; the soft dorsal has a median blackish longitudinal line; the dorsal and anal rays narrowly edged with blackish; the caudal fin is narrowly edged behind with gray, and has a wider submarginal band of blackish; the pectoral and ventral colored similarly to body.

This large species, which reaches a length of 300 millimeters, is described from twenty-seven specimens, ranging from 32 to

227 millimeters in length. They were collected at Ambil Island; southern coast of Batangas Province; Maricaban Island; Calapan and Bulalacao Bay, Mindoro; Elefante Island, Marinduque; Bennett Island, Masbate; Tagapula Island, Samar; Gigantangan Island, Leyte; Cebu, Cebu; Quiminatin Island, Cuyo Islands; and Sibutu and Sitankai Islands, Sulu archipelago. The two specimens from Ambil Island, 167 and 177 millimeters in length, are ripe male and female, collected August 28, 1925.

This species, which is here recorded for the first time from the Philippines, ranges from the Red Sea and the east coast of Africa, through the Malay Archipelago, southeastward to the Society Islands, and northward to the Hawaiian Islands.

CHAETODON BELLA-MARIS Seale. Plate 17, fig. 1.

Chaetodon bella-maris SEALE, Philip. Journ. Sci. § D 9 (1914) 72, pl. 1, fig. 1; AHL, Chaetodontidae, 112, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Dorsal XII, 24; anal III, 18; there are 34 scales in a lateral series, 9 between the lateral line and the origin of dorsal, and 14 between the lateral line and the origin of anal.

The body very deep and strongly compressed, with the back much elevated and the anterior dorsal profile from tip of snout to origin of dorsal very steep and nearly straight; the depth 1.6 times in length; head, which is about as long as deep, contained 3.2 times in length of body; the depth of caudal peduncle 2.4 times in length of head or 9 times in that of body; the interorbital prominently convex and contained 3 times in head; the eye large and circular, its diameter 3.2 times in head; the snout longer than either diameter of eye or width of interorbital, and 2.7 times in length of head; the maxillary, which is shorter than eye, is contained 3.4 times in head and ends posteriorly below anterior nostril; the width of preorbital behind maxillary slightly more than two-thirds eye; the mouth fairly small and the jaws even; the two nostrils in front of each eye small and close together, the anterior one circular and having a fleshy rim which is highest behind, the other an oval slit provided with a low marginal fleshy flap; the preopercle serrated on its outer edges.

The scales on each side of body large and in regular oblique series, those on head, vertical fins, and caudal very much smaller; the strongly elevated lateral line ascends upward and backward nearly to base of posterior dorsal spines in almost a straight line, and descends backward and downward, ending

before axil of dorsal; the dorsal spines evenly graduated to the last, which is the longest, 1.5 times in head; the second and third anal spines of nearly the same height, each approximately 1.5 times in head; both the rayed dorsal and anal slightly rounded; the caudal fin almost truncate; the pectoral is as long as head and ends above anus; the ventral extends past anus, its spine 1.8 times in head.

According to Seale the color in life is yellowish; a black ocular band, margined with white, which is slightly wider above than eye, is continuous above with the opposite band and extends below to lower margin of subopercle; the snout yellow, tip of upper jaw black; a large, black, wedge-shaped mark present on shoulder from spinous dorsal to the white border of the ocular band, this black area having a narrow black prong extending from its posterior margin to upper tip of opercle; the dorsal narrowly edged with black and the anal with brown; the caudal fin is tipped with white and has a wide submarginal band of black; there are twelve to fourteen rather wide, indistinct, brownish lines running obliquely forward and downward on the rows of scales; the ventrals and pectoral yellowish.

In alcohol the ground color is yellowish, the black markings have become deep brown, and the oblique lines on each side of body are yellowish brown; the brownish marginal line on anal has faded into the ground color.

The above account was taken from the type and only specimen in the Bureau of Science collection. It measures 132 millimeters in length and was collected by Seale in the Hongkong market in 1910.

Ahl had specimens from Takao, Formosa, Hongkong, and Canton. He states that the young of this species are extraordinarily similar to *Chaetodon lunula* and *C. fasciatus*. In his specimens he found the following variations: Dorsal XII, 23 to 26; anal III, 19 to 22; lateral line, 37 to 40; scales in transverse series 7 to 12.

CHAETODON ADIERGASTOS Seale. Plate 15, fig. 1.

Chaetodon adiergastos SEALE, Philip. Journ. Sci. § D 5 (1910) 116, pl. 1, fig. 2; AHL, Chaetodontidae, 112, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5 (after Seale).

Dorsal XII, 23 to 26; anal III, 20; there are 32 scales in a lateral series, 9 between the lateral line and the origin of dorsal, and 15 between the lateral line and the origin of anal.

The short deep body strongly compressed, the predorsal region and back much elevated, the depth 1.3 to 1.4 times in length; the small pointed head 2.8 to 3.2 times in length of body, its upper profile steep and concave, the interorbital space slightly convex; a more or less decided hump between head and origin of dorsal; the small, pointed, but rather broad snout 2.8 to 3.2 times in head; the large circular eye approximately equal to snout, 2.7 to 3.2 times in head and slightly greater than interorbital, which is contained 3 to 3.8 times; the maxillary 3.5 to 3.7 times in head; the preorbital more than half as wide as eye; the mouth small, with horizontal gape and equal jaws; the two small nostrils close together in front of each eye, the first one circular and provided with a fleshy rim which is higher posteriorly, the other oval and having a marginal flap; the preopercle finely serrated behind, and coarsely serrated at the angle and below.

The scales large on sides of body and small on head, vertical fins, and caudal; the lateral line very strongly elevated, rather straight in front and arched posteriorly to below base of fourth ray from axil; the middle dorsal spines stronger and higher than the posterior ones; second anal spine almost as long as third, which is contained 1.4 to 1.5 times in length of head; both soft dorsal and anal rounded; the caudal truncate; the pointed pectoral is slightly shorter than head and ends behind vertical through anus; the ventral extends beyond anus; its spine 1.6 to 1.9 times in head.

The ground color in alcohol yellowish brown; each side of body has numerous deep brown lines running obliquely downward and forward, each line passing through the middle of each row of scales; the black ocular band, wider than eye, ends below at lower edge of interopercle and is not united above with its fellow or with the very small black saddle on nape; the anterior two-thirds of soft dorsal and anal are edged with blackish and have a submarginal band of yellowish; the caudal fin has near its outer edge a blackish vertical band, which is bordered with yellowish in front and behind; the pectoral a little dusky and the ventral yellowish.

Here described from twenty-seven specimens, 79 to 125 millimeters long, coming from the following localities:

Mariveles, Bataan, 3 ripe females, 115 to 123 millimeters long, collected April 22, 1922.
Hamilo, Batangas, 4 specimens, each 119 millimeters long, one

of them a ripe female, collected April 22, 1922.
San Miguel Bay, Camarines Sur, 1.
Calapan, Mindoro, 6.

Inabanga and Guindulman, Bohol, 2.
 Gigantangan Island, Leyte, 1.
 Carnasa, Island, Leyte, a ripe female, 115 millimeters long, collected in February, 1925.

Bantayan Island, 2.
 Buenavista, Guimaras, 4.
 Guiminatin Island, Cuyo Islands, 2.
 Bungau Island, Sulu Archipelago, 1.

Seale had two specimens, both collected by Dr. Lawrence E. Griffin at Bantayan Island. Both have disappeared from the Bureau of Science collection. Seale's type was 116 millimeters in length.

CHAETODON FASCIATUS Forskål. Plate 9, fig. 2.

Chaetodon fasciatus FORSKÅL, Descr. Anim. (1775) 59, No. 80; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 47; GÜNTHER, Cat. Fishes 2 (1860) 24; AHL, Chaetodontidae, 117, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus fasciatus BLEEKER, Atlas Ichth. 9 (1878) 41, pl. 374, fig. 2.

Pomacentrus lunula LACÉPÈDE, Hist. Nat. Poiss. 4 (1803) 507, 510, 513.

Chaetodon lunula CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 45, pl. 173; GÜNTHER, Cat. Fishes 2 (1860) 25; Fische der Südsee 1 (1873) 42, pl. 33; JORDAN and EVERMANN, Bull. U. S. Fish Comm. 23¹ (1903) (1905) 366, pl. 54 and fig. 160; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 340.

Chaetodon flavus RÜPPELL, Atlas Fische (1828) 40, pl. 9, fig. 1.

Chaetodon biocellatus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 48 (young); GÜNTHER, Cat. Fishes 2 (1860) 9.

Chaetodon wiebeli KAUP, Nat. Tijd. Dierk. 1 (1863) 126.

Dorsal XII, 23 to 25; anal III, 18 or 19; there are 34 to 38 scales in a lateral series, 9 between the lateral line and the origin of dorsal, and 16 between the lateral line and the origin of anal.

The body very deep and compressed, its depth 1.5 to 1.7 times in length and its dorsal profile much more elevated than the ventral; the head about as long as deep, 2.8 to 3.1 times in length of body, its upper profile from tip of snout to origin of dorsal fin very slightly concave; the caudal peduncle very short and deep, its least depth 8.7 to 9.3 times in length of body or 5.3 to 6 times in depth; the broad interorbital space 3.5 to 4 times in length of head or approximately as wide as length of maxillary, which is contained 3.5 to 3.9 times; the circular eye halfway between tip of snout and vertical passing through posterior margin of opercle, 2.9 to 3.6 times in length of head; the snout slightly produced and longer than eye, 2.5 to 2.7 times in head; the width of preorbital behind maxillary nearly equal to eye; mouth small, with the jaws a little produced and

about even; the two nostrils in front of eye close together, the one in front circular and provided with a rather high fleshy flap posteriorly, the other more of an oblique slit with a low marginal flap; the margins of preopercle serrated.

The scales on side of body in regular oblique series and rather large, those toward fins becoming very small; the lateral line strongly arched and not continued beyond base of posterior dorsal rays; the middle dorsal spines about as high as posterior ones, the last dorsal spine 1.5 to 1.9 times in length of head; the second and third anal spines equal and longer than last dorsal spine; both the rayed vertical fins broadly rounded; the caudal broad and convex; the broad and slightly rounded pectoral is about twice length of snout and ends just above anus; the pointed ventral extends a little beyond it, its spine shorter than third anal.

The life colors of a specimen collected by R. C. McGregor in Guam were as follows: The ground color was yellow; the shoulders were dusky; there was a wide vertical black band across eye, and the space between this and the dusky shoulder was white; the caudal peduncle was black; there was a white-margined black band near base of soft dorsal; the vertical fins were edged with dusky; the body had brownish orange lines obliquely descending forward.

The ground color in alcohol is yellowish brown, with blackish brown bands running downward and forward; the black ocular band, which is wider than eye, unites on interorbital space with its fellow and terminates below at lower edge of preopercle; a broad black band edged behind with white runs from gill opening above base of pectoral to base of middle dorsal spines and appears to unite with another black band, which covers base of anterior dorsal spines and extends to origin of fin; a third black band is situated between the last-mentioned two and is broadly edged with white; a white-edged black band runs along base of soft dorsal and widens out toward caudal peduncle which it covers; the vertical fins are margined with black; the caudal fin has a whitish margin and a submarginal band of black; the other fins are yellowish. In the young the black band along anterior portion of trunk appears as a large triangular blotch and the space between it and the ocular band is milk white; there is a round white-edged black ocellus along middle of soft dorsal fin.

The above description is based upon a study of nine specimens, 51 to 157 millimeters long, from the following localities: Cur-

rimao, Ilocos Norte; Balaoan, La Union; Manila Bay; Monja Island, off the entrance to Manila Bay; the southern coast of Batangas Province; Calapan, Mindoro; Cebu, Cebu; and the southern coast of Cotabato Province. Our largest example, collected in Batangas Province March 15, 1925, is a ripe female.

This very beautiful species, not hitherto recorded from the Philippines, has an enormous range, occurring from the Red Sea throughout the Indian Ocean and Malay Archipelago, northward to China, and eastward to Hawaii and the Marquesas. It presents such wide variations in coloration that we do not hesitate to regard *Chaetodon fasciatus* Forskål as identical with the present species.

CHAETODON SELENE Bleeker. Plate 10, fig. 1.

Chaetodon selene BLEEKER, Nat. Tijds. Ned. Ind. 5 (1853) 76; GÜNTHER, Cat. Fishes 2 (1860) 30; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1907) 96; AHL, Chaetodontidae, 119, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus selene BLEEKER, Atlas Ichthy. 9 (1878) 44, pl. 377, fig. 5.

Dorsal XII, 20 to 22; anal III, 18 or 19; there are 28 to 32 scales in a lateral series, 9 between the lateral line and the origin of dorsal, and 14 between the lateral line and the origin of anal.

The body very deep and much compressed, the back more strongly elevated than the ventral, and the anterior dorsal profile very steep; the depth of body 1.6 to 1.7 times in length; the head nearly as long as deep, 3 to 3.2 times in length of body, the anterior upper profile very slightly concave; the depth of the short, compressed, caudal peduncle contained 8.8 to 9 times in length of body; the evenly convex interorbital as wide as eye, which is 3.3 to 3.4 times in head; the eye circular and halfway between tip of snout and posterior margin of opercle; the pointed, conical snout much longer than either eye or maxillary, the latter being 3.4 to 3.5 times in length of head; the preorbital about as wide as interorbital space or diameter of eye; the mouth small, lower jaw slightly in advance of upper; there are two nostrils in front of each eye, the anterior one circular and provided with a fleshy rim which is highest behind, the other one a slightly oblique slit, somewhat hidden above by overlapping skin, and about halfway between anterior nostril and front margin of eye; the preopercle finely serrated at the angle.

The scales on sides large and in slightly oblique series, those covering head and fins becoming very small; the dorsal spines become higher posteriorly from the fourth, which is 1.9 times in length of head; the third anal spine much higher than the last dorsal spine, 1.6 times in head; both the rayed dorsal and anal broadly rounded; the caudal fin truncate; the pectoral fin pointed and longest above, 4.1 to 4.2 times in length of body or 1.3 to 1.4 times in that of head, its tip scarcely reaching above anus; the ventral fin is also pointed and ends before anus, its spine twice in head.

The ground color in alcohol yellowish brown; on each side of body below lateral line brown lines run obliquely backward and upward, following the oblique series of the scales; on each scale on anterior portion of body on the lateral line and above it is a whitish spot (carmine red or golden in life); an ocular band, narrower than eye, extends from origin of dorsal fin to lower margin of interopercle; it is blackish brown above eye and margined with pearl white and whitish below it; a broad crescentlike blackish band along base of dorsal, crossing anterior portion of caudal peduncle to middle of anal; the soft dorsal and anal show traces of the blackish inframarginal stripe; the caudal grayish along its posterior edge; the ventral whitish.

Five specimens, collected at Puerto Galera and Bulalacao Bay, Mindoro, measure 120 to 128 millimeters in length. The only previous Philippine record of this species is from Bacon, Sorsogon, by Evermann and Seale. Elsewhere it is known only from Celebes and the Moluccas.

CHAETODON CARENS Seale. Plate 15, fig. 2.

Chaetodon carens SEALE, Philip. Journ. Sci. § D 5 (1910) 116, pl. 1, fig. 1; AHL, Chaetodontidae, 77, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5 (after Seale).

Dorsal XIII, 20; anal III, 16; there are 34 scales in a lateral series, 10 between the lateral line and the origin of dorsal, and 22 between the lateral line and the origin of anal.

The body moderately deep and strongly compressed, the back much elevated and the anterior dorsal profile from tip of snout to nuchal region nearly straight, and on shoulder very slightly convex; the depth of body contained 1.7 times in length; the head as long as deep, 3.1 times in length of body; the depth of the small caudal peduncle 9.8 times in length of body or 3.1 times in that of head; the convex interorbital as wide as the length of the short pointed snout, which is contained 3.1

times in head; the large circular eye 2.8 times in head and longer than maxillary which is contained 3.8 times; the preorbital more than half as wide as eye; the small mouth slightly oblique, the jaws nearly even; the two nostrils small, close together, in front of each eye, the anterior one circular and surrounded by a fleshy rim which is highest behind, the other rounded and having a low fleshy rim in front; the preopercle finely serrated behind and below.

The scales on middle of side large, becoming smaller on the outer portions, those on head very small to minute; the lateral line is moderately arched, highest below base of posterior dorsal spines, and ends posteriorly just before axil; the dorsal spines evenly graduated from third, which is the highest and shorter than head by about two-thirds eye; the second and third anal spines of about the same height, each 1.3 times in head; the soft dorsal and anal rounded; the caudal truncate; the short pectoral is equal to head, less than half the eye, and does not extend to vertical through anus; the ventral reaches to a little behind anus, its spine 1.5 times in head.

The ground color in alcohol brownish, becoming darker on top of head, on extreme hind portion of trunk including caudal peduncle, and on vertical fins; the soft dorsal and anal narrowly edged with white; the caudal yellowish on its anterior half and dusky on the remaining portion; the ventral dusky and the pectoral yellowish.

Here described from the type and only specimen, 88 millimeters in length, Bureau of Science collection, obtained at Bantayan Island in May, 1909, by Dr. Lawrence E. Griffin.

CHÆTODON EPHIPIUM Cuvier and Valenciennes.

Chætodon ephippium CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 7 (1831) 61, pl. 174; LESSON, Zool. Voy. Coquille 2 (1830) 174; Atlas, Poiss. (1826) pl. 29, fig. 1; GÜNTHER, Cat. Fishes 2 (1860) 7; Fische der Südsee 1 (1873) 36, pl. 27, figs. A and B; SEALE, Occ. Papers Bishop Museum 1 (1901) 97; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 343; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 269; AHL, Chaetodontidae, 65, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chætodon principalis CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 62.

Chætodon mulsanti THIOLLIÈRE, Ichthy. l'île Woodlark (1856) 163.

Chætodon pepeke MONTROUZIER, Ichthy. l'île Woodlark (1856) 163.

Tetragonopterus ephippium BLEEKER, Atlas Ichthy. 9 (1878) 36, pl. 378, fig. 2.

Dorsal XIII, 24; anal III, 21 or 22; there are 34 to 36 scales in a lateral series, 11 between the lateral line and the origin of dorsal, and 16 between the lateral line and the origin of anal.

The body deep and much compressed, with the back a little more arched than the ventral outline, the depth contained 1.7 times in length; the head as long as deep, 3.2 to 3.4 times in length of body, the upper profile convex; the caudal peduncle deeper than long, 9.2 to 9.5 times in length of body; the broad strongly convex interorbital from 3.5 to 3.8 times in head and wider than the diameter of the small, circular eye, which is contained 4 to 4.2 times in head and situated midway between tip of snout and posterior margin of opercle; the long horizontal snout conspicuously pointed and conical, 2.4 times in length of head and 1.7 to 1.8 times eye; the short maxillary 3.8 to 3.9 times in head, a little shorter than width of preorbital which is contained 3.3 to 3.4 times; the mouth small, lower jaw slightly in advance of upper; two nostrils close together in front of each eye, the front one circular and provided with a fleshy rim which is highest behind, the posterior one a slightly oblique slit partly covered by an overhanging skin above; the preopercle finely serrated below and behind.

The scales on each side of trunk large and in regular horizontal and vertical series, those on head and fins becoming small to minute; the lateral line is strongly arched, and ceases a little in front of axil of dorsal fin; dorsal spines evenly graduated to the last, which is the highest, 1.4 to 1.5 times in head; the third anal spine 1.5 to 1.6 times in head or thrice in depth of body; the soft dorsal has the fifth ray elongate and filiform, and the rayed anal broadly rounded; the caudal truncate; the pectoral slightly rounded and longest superiorly, 2.4 to 2.5 times in depth of body, its posterior end above anus; the ventral is pointed and scarcely reaches to anus, the spine 1.8 to 1.9 times in length of head.

In alcohol the ground color varies from yellowish brown to rust brown, fading respectively into yellowish and yellowish brown below; on the lower half of body are a number of longitudinal grayish bands, which follow the horizontal series of scales; there is a trace of a vertical blackish band crossing head through each eye, and of another below fourth dorsal spine; a very large subovate black patch, edged with pearl white anteriorly and below and with yellowish above and behind, covers the greater portion of dorsal and posterior part of back; a black-

ish margin on spinous and soft dorsal, the latter portion having a submarginal line of black; the anal is edged with grayish and has a submarginal band of brown; the caudal rays, with the exception of the uppermost and lowermost ones, each margined above and below with blackish; the ventral and pectoral fins have the same color as the background.

Here described from three examples, 90 to 157 millimeters long, from Santo Domingo de Basco, Batan Island, Batanes Province; from the southern coast of Batangas Province; and from Tubigan Island, Sulu Archipelago. Jordan and Richardson have recorded this species previously from Cagayancillo, one of the Cagayan Islands.

This very handsome fish occurs throughout the East Indian Archipelago and Polynesia to Hawaii and the Society Islands.

CHÆTODON KLEINI Bloch. Plate 13, fig. 2.

Chætodon kleini BLOCH, Ichtyologie 7 (1797) 4, pl. 218, fig. 2; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 23; GÜNTHER, Cat. Fishes 2 (1860) 22; PETERS, Monatsber. Akad. Wiss. Berlin (1876) 832; DAY, Fishes of India (1878) 106; JORDAN and SEALE, Bull. Bur. Fisheries 26 (1907) 34; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 269; AHL, Chaetodontidae, 144, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus kleini BLEEKER, Atlas Ichth. 9 (1878) 45, pl. 373, fig. 3.

Chætodon melanomystax BLOCH and SCHNEIDER, Syst. Ichth. (1801) 224.

Chætodon melanostomus BLOCH and SCHNEIDER, Syst. Ichth. (1801) 224.

Chætodon flavescens BENNETT, Proc. Zool. Soc. London (1831) 61.

Chætodon virescens CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 23.

Dorsal XIII (rarely XIV), 21 or 22; anal III, 18 or 19; there are 30 to 33 scales in a lateral series, 8 or 9 between the lateral line and the origin of dorsal, and 13 between the lateral line and the origin of anal.

The depth of the strongly compressed, subcircular body contained from 1.5 to 1.6 times in length, with the back highly elevated; the head very deep, its length 3.4 to 3.6 times in that of body, the dorsal profile very steep; the depth of caudal peduncle 9.5 to 9.9 times in length of body; the strongly convex interorbital contained from 2.8 to 3.4 times in head; the circular eye a little closer to tip of snout than to vertical through posterior edge of opercle, its diameter 2.8 to 3.3 times in length of head and nearly as long as the obtuse, bluntly pointed snout,

which is contained from 2.6 to 3.1 times; the maxillary rather short, 3.5 to 4.4 times in head and slightly longer than width of preorbital behind it, which is greater than half eye diameter; the mouth small and nearly horizontal, the jaws equal; the nostrils small and close together in front of each eye, the anterior one with a small fleshy rim prolonged into a high flap behind, the posterior nostril oval and provided with a fleshy flap in front; the preopercular edges finely serrated.

The scales on each side of trunk moderately large, those on head, vertical fins, and caudal becoming very small; the strongly arched lateral line extends to a little in front of axil of dorsal fin; the middle dorsal spines about as high as posterior ones, the second anal spine nearly as long as third which is contained from 1.2 to 1.3 in head; both soft dorsal and anal broadly round; the caudal fin truncate; the pectoral is about as long as head and does not extend to above anus; the ventrals end at anus, their spines 1.3 to 1.5 times in head.

In life the ground color yellowish; on anterior portion of trunk a rather wide dusky brown transverse band; the posterior half shaded with brownish, which extends to caudal peduncle, anal, and soft dorsal fins; on the shaded area scattered pearl white spots; a black ocular band, nearly as wide as eye, descends from nape to extremity of ventrals; the lips and top of snout black; the soft dorsal and anal are edged with white and have a submarginal line of black; the bright lemon yellow caudal has a rather wide grayish band at posterior edge; the pectoral fin blackish.

In alcohol the ground color of body and fins yellowish brown; the ocular band and the narrow submarginal lines on soft vertical fins blackish; the dark portions on trunk deep brown, the spot on posterior half of trunk whitish to reddish; the pectoral grayish, as is the caudal at its outer margin; both the rayed dorsal and anal narrowly edged with whitish.

Here described from thirty-seven specimens, 35 to 109 millimeters long, coming from the following localities: Luna, La Union; Olongapo, Zambales; Sisiman and Mariveles, Bataan; Hamilo, Batangas; Calapan and Bulalacao Bay, Mindoro; Gigan-tangan Island, Leyte; Quiminatin Island, Cuyo Islands; Samal Island and Zamboanga, Mindanao; and Sibutu Island, Sulu Archipelago. The specimen from Hamilo, 90 millimeters long, is a ripe female, collected April 25, 1922.

This beautiful fish has been listed previously from the Philippines by Jordan and Seale from Manila, and by Jordan and Richardson from Cagayancillo. It occurs from the east coast of Africa, through the seas of India and the East Indian Archipelago, northward to the coast of China, and eastward to the Carolines.

CHÆTODON PUNCTATO-FASCIATUS Cuvier and Valenciennes. Plate 12, fig. 1.

Chætodon punctato-fasciatus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 22; GÜNTHER, Cat. Fishes 2 (1860) 27; JORDAN and EVERMANN, Bull. U. S. Fish. Comm. 23¹ (1903) (1905) 369, fig. 162; JORDAN and SEALE, Bull. Bur. Fisheries 26 (1906) 34; AHL, Chaetodontidae, 100, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus punctato-fasciatus BLEEKER, Atlas Ichthy. 9 (1878) 40, pl. 274, fig. 3.

Chætodon multicinctus GARRETT, Proc. Cal. Acad. Sci. 3 (1863) 65; GÜNTHER, Fische der Südsee 1 (1873) 44, pl. 34, fig. B (after Garrett's drawing).

Dorsal XIII, 23 or 24; anal III, 17 or 18; there are 32 to 38 scales in a lateral series, 9 between the lateral line and the origin of dorsal, and 16 between the lateral line and the origin of anal.

The body oblong, deep and compressed, with the back much elevated; the depth contained 1.7 times in length; the head deep, compressed, and bluntly pointed, a little shorter than deep, its length 3.2 times in that of body and its dorsal profile somewhat undulating from tip of snout to origin of dorsal; the depth of the small caudal peduncle 10 times in length of body or 3.1 to 3.2 times in depth; the convex, narrow interorbital 3.4 to 3.5 times in length of head; the eye small, circular, placed a little anteriorly, its diameter equal to the length of the blunt, slightly produced snout, which is 2.9 to 3 times in head; the maxillary rather short, 4.2 to 4.9 times in head; the width of preorbital behind maxillary a trifle greater than length of maxillary or two-thirds eye, and 3.8 to 4 times in length of head; the mouth small, jaws small and bluntly produced; the two nostrils in front of eye close together, the anterior one circular and provided with an elevated fleshy flap behind, the more posterior simple, oval, and very slightly oblique; the preopercle entire.

Moderately large scales cover side of body, those on head and vertical fins becoming very small; the lateral line moderately arched, ending below base of posterior dorsal rays; the middle dorsal spines higher than the last one, which is contained 1.4

times in length of head; the second and third anal spines of about the same height, each being higher than last dorsal spine; both dorsal and anal fins rounded posteriorly; the caudal fin convex; the pointed pectoral is about as long as head and does not quite extend to anus; the ventral fin ends at anal opening, its spine 1.4 times in head.

The ground color of nearly fresh specimens was bright lemon yellow; each scale on body had an olive spot at base, the spots becoming smaller on the scales toward fins; the side of body had seven nearly vertical olive bands, the first and last ones indistinct; there was a black spot on nape of neck; just below this spot a yellowish band edged with olive ran down through eye to inferior limb of preopercle; the dorsal fin had an outer margin of lemon yellow, and two submarginal lines of black and white; the caudal fin was lemon yellow near base and brownish outwardly, the two colors being separated by a black crossband; the anal fin had two submarginal lines of black and white, the margin of the fin was lemon yellow; both pectoral and ventral were lemon yellow.

In alcohol the ground color turned yellowish brown, the spots on the scales dusky; the vertical bands on side brownish olive; the ocular band is reduced to a pale, brown-edged streak; the spot above occiput before origin of dorsal and the crossband on caudal black; the submarginal lines on the vertical fins of blackish and whitish coloration.

The above account is based upon a study of two Bureau of Science specimens, 68 and 70 millimeters in length, from the southern coast of Batangas Province, and Calapan, Mindoro. A previous Philippine record of this species is that of Jordan and Seale, of three examples, purchased in the Manila market.

Elsewhere this species is known from the seas of Banda and the Hawaiian Islands, and undoubtedly occurs in the intervening regions.

CHÆTODON UNIMACULATUS Bloch. Plate 11, fig. 1.

Chætodon unimaculatus BLOCH, *Ichtyologie* 6 (1788) 54, pl. 201, fig. 1; CUVIER and VALENCIENNES, *Hist. Nat. Poiss.* 7 (1831) 55; GÜNTHER, *Cat. Fishes* 2 (1860) 11; JORDAN and EVERMANN, *Bull. U. S. Fish Comm.* 23¹ (1903) (1905) pl. L and fig. 161; JORDAN and SEALE, *Bull. Bur. Fisheries* 25 (1905) (1906) 342.

Tetragonoptrus unimaculatus BLEEKER, *Atlas Ichth.* 9 (1878) 45, pl. 375, fig. 5.

Chætodon sphenospilus JENKINS, *Bull. U. S. Fish. Comm.* 19 (1899) (1901) 395, fig. 8.

Dorsal XIII, 22 or 23; anal III, 19 or 20; there are 40 scales in a lateral series, 10 between the lateral line and the origin of dorsal, and 19 between the lateral line and origin of anal.

The body deep, compressed, with the dorsal profile a little deeper than the ventral; the depth of body contained 1.5 to 1.6 times in length; the head slightly shorter than deep, its length 3.1 to 3.4 times in that of body, and its upper profile obliquely concave; the depth of the short caudal peduncle 8.9 to 9.2 times in length of body or 5.8 to 6 times in depth; the interorbital space broad and slightly convex, its width 2.8 to 3.1 times in length of head; the eye small, circular and placed about midway from tip of snout to vertical passing through posterior edge of opercle, its diameter 3 to 3.7 times in head; the snout bluntly rounded and rather short, 2.4 to 2.8 times in head; the maxillary is much shorter than snout, contained 3 to 3.4 times in head, and does not quite reach to below front edge of orbit; the width of preorbital about two-thirds diameter of eye; the mouth small, gape short, and jaws equal and slightly produced; the two nostrils in front of eye close together, the anterior one with a fleshy flap which is highest posteriorly, the other oval and oblique; the marginal portion of preopercle not serrated.

The scales on side of body large anteriorly, becoming smaller posteriorly and toward fins, arranged in nearly horizontal series; the moderately arched lateral line ends below base of last dorsal rays; the middle dorsal spines slightly higher than the posterior ones, the rayed vertical fins rounded posteriorly; caudal slightly convex; the pointed pectoral nearly as long as head; the ventral fin also pointed, its spine a little shorter than last dorsal spine, and 1.5 to 1.6 times in length of head.

The color in life of a young specimen obtained at Sitankai Island, Sulu Archipelago, was yellow, with a black ocular band which descended from top of head and nape to breast and was about as broad as eye; a narrower black band over the posterior portions of the rayed vertical fins and across caudal peduncle; the remaining portion of dorsal and anal, and the other fins were colored similarly to body; there was a large round black spot on lateral line below the six posterior dorsal spines.

In alcohol the ground color is paler, and the bands across head and over the soft vertical fins and caudal peduncle are brownish black; the large blotch on lateral line also brownish black.

Of this species we have examined ten examples, varying from 19.5 to 135 millimeters in length. They were collected at Santo Domingo de Basco, Batan Island, Batanes Province;

Mariveles, Bataan Province; southern coast of Batangas Province; Tagapula Island, Samar; New Washington, Capiz; Simara Island, Romblon Province; Quiminatin Island, Cuyo Islands; Jolo and Sitankai in the Sulu Archipelago. It has been recorded previously in the Philippines by Evermann and Seale from Bacon, Sorsogon.

This handsome, widely distributed species occurs from Ceylon through the East Indies to Hawaii and Tahiti.

On some specimens, particularly in the young, there is a more or less well-developed wedge-shaped area extending downward from the large black blotch on the lateral line. This is rarely the case in Philippine specimens. The two specimens from Mariveles, Bataan Province, collected April 24, 1922, each with a length of 95 millimeters, were ripe females ready to spawn.

CHÆTODON TRIFASCIATUS Mungo Park. Plate 13, fig. 1.

Chætodon trifasciatus MUNGO PARK, Trans. Linn. Soc. 3 (1797) 34; JENKINS, Bull. U. S. Fish Comm. 22 (1902) (1903) 474; JORDAN and EVERMANN, Bull. U. S. Fish Comm. 23¹ (1903) (1905) 372, pl. 52; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 344; Bull. Bur. Fisheries 26 (1906) (1907) 33; JORDAN and RICHARDSON, Bull. Bur. Fisheries 23 (1907) (1908) 269; WEBER, Fische Siboga Exp. (1913) 304; AHL, Chaetodontidae, 56, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chætodon trifasciatus var. *arabica* STEINDACHNER, Denkschr. Akad. Wiss. Wien 71 (1902) 138, pl. 2, fig. 3.

Tetragonopterus trifasciatus BLEEKER, Atlas Ichthy. 9 (1878) 35, pl. 377, fig. 1.

Chætodon vittatus BLOCH and SCHNEIDER, Syst. Ichth. (1801) 227; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 26; LAY and BENNETT, Fishes in Zool. Beechey's Voy. (1839) 61, pl. 17, fig. 3; GÜNTHER, Cat. Fishes 2 (1860) 23; DAY, Fishes of India (1878) 107, pl. 27, fig. 5.

Chætodon tau-nigrum CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 29; GÜNTHER, Cat. Fishes 2 (1860) 32.

Chætodon austriacus RÜPPELL, Neue Wirbelt. Abyssinien, Fische (1835) 30, pl. 9, fig. 2.

Dorsal XIII, 21 to 23; anal III, 18 to 20; there are 32 to 38 scales in a lateral series, 6 or 7 between the lateral line and the origin of dorsal, and 14 or 15 between the lateral line and the origin of anal.

The depth of the compressed and rather elongate body 1.6 to 1.8 times in length; the back trenchant, head deep, its profile steep above and its length 3.1 to 3.5 times in length of body; the depth of the small caudal peduncle 9.5 to 9.9 times

in length of body; the broad, strongly convex interorbital 2.6 to 3.2 times in head; the circular eye 2.8 to 3.2 times, rather high and anterior in head; the snout short, bluntly rounded, 2.8 to 3.6 times in length of head; the maxillary very short and contained from 3.5 to 4.1 times in head, a little longer than width of interorbital behind it, which is about half the diameter of eye; the small mouth horizontal, jaws even; the two nostrils before eye close together, the first one circular and having a fleshy rim around it which is highest behind, the posterior one a simple rounded opening; the preopercle serrated behind and below.

The scales on side of body large and in nearly vertical series, becoming small toward head, and on vertical fins and caudal; the lateral line is slightly arched and ends below anterior third portion of the rayed dorsal; the sixth and seventh dorsal spines highest, each 1.3 to 1.4 times in depth of body and slightly longer than third anal spine, which is contained from 1.2 to 1.5 times in head; the soft portions of vertical fins rather angular posteriorly; the caudal fin small and convex behind; the pectoral fin about as long as head and contained from 2 to 2.3 times in depth of body, its tip above anus; the ventral fin scarcely reaches anus, its spine 1.5 to 1.8 times in head.

The ground color in life creamy orange, grayer above, with many longitudinal streaks of violet-blue along sides; the forehead brown, jaws and chin blackish; a golden yellow band crosses head through anterior portion of eye; a black ocular band, narrower than orbit, descends from nape to the most anterior part of breast; behind this band a golden yellow one, crossing hind portion of eye, which is bordered behind by another narrow vertical black streak passing through posterior limb of preopercle; the opercle creamy orange; the spinous dorsal yellowish, with purplish lines below; the soft dorsal has a black band near base, which becomes wider posteriorly and extends to top of caudal peduncle; this band bordered on each side with golden yellow; the rest of the color markings of dorsal as follows outwardly: A violet line running longitudinally across middle, then a broad yellowish band, a violet-gray line, and a rather wide creamy brown marginal band; the caudal peduncle slaty, the middle of caudal fin crossed by a black, gold-margined band; the anal rays have a basal black gold-margined bar, their margin yellow or clear; the spinous portion of anal rich brown; the ventral fin golden yellow and the pectoral transparent.

In alcohol the ground color yellowish, the darker portions of head blackish and the lighter ones whitish; the longitudinal stripes on body violet-brown; the black bands and lines on caudal and vertical fins still distinct, and the lighter portions yellowish; the spinous portion of anal brownish and the dark brown band on fin has turned blackish; the pectoral is pale and the ventral has a yellowish wash.

The Bureau of Science specimens are from 50 to 101 millimeters long, and were collected at the following places:

Mariveles, Bataan, 1.	Quiminatin Island, Cuyo Islands, 2.
Aloneros, Tayabas, 3.	
Calapan, Mindoro, 19 specimens, two of which are ripe females, 90 and 101 millimeters long, collected January, 1921.	Puerto Princesa and Balabac Island, Palawan, 5.
Bulalacao Bay, Mindoro, 1.	Cagayan, Misamis Province, Mindanao, 1.
Tablas Island, 1.	Basbas, Tawitawi, Bungau, Sibutu, and Sitankai Islands, Sulu Archipelago, 11.
Bantayan Island, 1.	

This species has been recorded previously from the Philippines by Jordan and Seale from Cavite and by Jordan and Richardson from Cagayancillo. It is very common in the East Indies and ranges from the east coast of Africa to Polynesia, where it occurs as far southeastward as the Paumotu Islands, and north to Hawaii.

CHÆTODON BENNETTI Cuvier and Valenciennes. Plate 8, fig. 2.

Chætodon bennetti CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 64; GÜNTHER, Cat. Fishes 2 (1860) 12; PLAYFAIR, Fishes of Zanzibar (1866) 33; GÜNTHER, Fische der Südsee 1 (1873) 37, pl. 29, fig. A; AHL, Chaetodontidae, 73, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chætodon vinctus BENNETT, Zool. Beechey's Voyage Fishes (1839) 62, pl. 17, fig. 1 (very bad).

Tetragonopterus bennetti BLEEKER, Atlas Ichth. 9 (1878) 34, pl. 376, fig. 2.

Dorsal XIV, 17; anal III, 16; there are 46 scales in a lateral series, 12 between the lateral line and the origin of dorsal, and 18 between the lateral line and vent. Elsewhere specimens vary as follows: Dorsal XIII–XIV, 17 to 19; anal III, 15 to 17; lateral series of scales 40 to 46; transverse 9 or 10 and 17 to 20.

The body deep, rather thick, with the dorsal and ventral profiles about equally elevated, the depth 1.5 times in length; the small head slightly shorter than deep, 3.5 times in length of body, dorsal profile oblique and nearly straight; the caudal

peduncle deeper than long, its least depth 8.8 times in length of body or 2.5 times in length of head; the strongly convex interorbital rather wide, 2.8 times in head; the eye circular, a little anterior, its diameter 3.3 times in head; the snout obtuse, nearly equal to width of interorbital or 2.7 times in head; the maxillary nearly as long as eye, 3.5 times in head; the preorbital wider than half eye diameter; the mouth small and slightly oblique, jaws about even; two nostrils in front of each eye, both circular, the anterior one has a wide fleshy flap behind and the other is a simple opening; the preopercle finely serrated behind and indistinctly denticulated at the angle.

The scales covering side moderate in size, those on head and fins from small to minute; the lateral line is very slightly arched and stops a little before the axil of the rayed dorsal fin; of the dorsal spines the middle ones are the highest; the second and third anal spines about equal in height, each 1.4 times in head; the soft portions of vertical fins rounded; the caudal fin rather truncate; the pectoral fin pointed and longest superiorly, ending some distance before vertical through anus; the ventral is also pointed and does not reach anus, its spine 1.5 times in length of head.

The ground color in alcohol deep yellowish brown; a white-edged blackish violet band descending from back of neck through eye to lower edge of interopercle and a large, round, white-edged black blotch on lateral line on each side of back below posterior dorsal spines; two oblique pearl white bands run from opercle toward anal fin, one above the root of pectoral and the other below; the soft vertical fins and the caudal broadly margined with blackish; the other fins yellowish.

Here described from a specimen in the Bureau of Science collection, 132.5 millimeters in length, obtained on the southern coast of Batangas Province. It is a ripe female, collected March 15, 1925.

This unusually beautiful species, which is new to the Philippines, is recorded from Zanzibar, the Moluccas, and several Polynesian groups of islands.

CHÆTODON SPECULUM Kahl and Van Hasselt. Plate 14, fig. 2.

- Chætodon speculum* Kuhl and Van Hasselt in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 56; GÜNTHER, Cat. Fishes 2 (1860) 12; WEBER, Fische Siboga Exp. (1913) 304; AHL, Chaetodontidae, 75, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5. *Citharoedus speculum* KAUP, Archiv für Naturg. 26 (1860) 145. *Tetragonopterus speculum* BLEEKER, Ned. Tijds. Dierk. 2 (1865) 189; BLEEKER, Atlas Ichthy. 9 (1878) 34, pl. 375, fig. 3.

Dorsal XIV, 17; anal III, 16; there are 38 to 40 scales in a lateral series, 12 between the lateral line and the origin of dorsal, and 18 between the lateral line and the origin of anal.

The body compressed and deep, 1.5 to 1.6 times in length, the profiles about equally elevated; the small head much shorter than deep, 3.2 to 3.5 times in length of body, its upper profile almost straight and very steep; the depth of the short caudal peduncle 4.7 to 6 times in that of body or 7.7 to 8.7 in its length; the wide, convex interorbital 2.7 to 2.9 times in length of head and wider than either length of maxillary or diameter of eye, which are contained 3.3 to 3.5 and 2.9 to 3.3 times, respectively; the snout short and obtuse, 2.7 to 2.9 times in head; the eye circular and slightly anterior; the preorbital slightly concave in front, its greatest width almost two-thirds diameter of eye; the mouth small, its gape slightly oblique and the jaws equal; the two nostrils in front of each eye close together, the anterior one circular and having a fleshy rim which is deepest behind, the other a simple oval opening, nearly vertical in position; the preopercle serrated behind and below.

The scales on side moderate in size, those on head and fins small to minute; the slightly arched lateral line ends below posterior third portion of rayed dorsal; middle dorsal spines highest, the last one shorter than third anal spine, which is 1.3 to 1.4 times in length of head and about as long as second anal spine; the soft portions of dorsal and anal broadly rounded; the caudal slightly convex; the pectoral pointed and longest above, 2.3 to 2.8 times in depth of body, ending some distance before vertical through anus; the ventral fin does not extend to anus, its spine 1.3 to 1.5 times in head.

The ground color in alcohol yellowish brown; a blackish ocular band, which is slightly convex anteriorly and narrower than eye, descends from nape to breast, joining with the opposite band above and below; a large blackish ovate blotch about the size of head on side below middle of dorsal fin; a rather wide grayish band on outer portion of caudal fin, the rest of the fin yellowish; the other fins yellowish.

Here described from seven fairly large specimens measuring from 92.5 to 122 millimeters in length. They were collected in the following localities: Southern coast of Batangas Province; Calapan, Mindoro; Masbate Island; Gigantangan Island, Leyte; and Quiminatin Island, Cuyo Islands. With the exception of the specimens from Calapan and Quiminatin, all are females

nearly ready to spawn and were collected February 19 and March 15, 1925, and June 5, 1922.

This species, which is new to the Philippines, occurs elsewhere only from the Moluccas to New Guinea.

In general coloration and proportions, this species closely resembles *Chaetodon bennetti* (Bleeker), from which it differs in the absence of two white lines running obliquely backward from the opercle, and of the blackish edges on the caudal and soft vertical fins.

CHAETODON CITRINELLUS Broussonet. Plate 14, fig. 1.

Chaetodon citrinellus Broussonet in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 21; CUVIER, Règne Anim., Poiss. (1817) pl. 39, fig. 1; GÜNTHER, Cat. Fishes 2 (1860) 33; Fische der Südsee 1 (1873) 47, pl. 35, fig. B (figure poor); JORDAN and EVERMANN, Proc. U. S. Nat. Mus. 25 (1903) 357; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 344; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 269; AHL, Chaetodontidae, 104, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tetragonopterus miliaris (not of Quoy and Gaimard) BLEEKER, Atlas Ichth. 9 (1878) 39, pl. 377, fig. 3.

Chaetodon nigripes DE VIS, Proc. Linn. Soc. N. S. Wales 9 1(884) 453.

Dorsal XIV, 22; anal III, 17; there are 40 to 42 scales in a lateral series, 10 between the lateral line and the origin of dorsal, and 16 between the lateral line and the origin of anal.

The deep body strongly compressed, with the back very much elevated, the depth 1.7 to 1.9 times in length, the head a little shorter than deep, 2.9 to 3.2 times in length of body, the upper profile along interorbital space slightly arched; the depth of caudal peduncle 8 to 9.2 times in length of head; the broad, evenly convex interorbital 3.3 to 3.5 times in head; the circular eye fairly large, its diameter 2.5 to 2.7 times in head; the short and slightly pointed snout slightly shorter than eye, 2.7 to 3.3 times in head; the maxillary as long as width of preorbital, which is 3.8 to 4 times in length of head and narrower than diameter of eye; the mouth small and horizontal, jaws about even; the two nostrils close together in front of each eye simple circular openings, the anterior one the smaller; the preopercle distinctly serrated.

The scales on side moderate in size, those on head, vertical fins, and caudal very small; the moderately arched lateral line stops in front of axil of dorsal fin; the middle dorsal spines higher than the posterior ones, the third anal spine shorter

than second which is 3.6 times in head; the soft dorsal and anal rounded; the caudal fin slightly convex; the pectoral equals head in length and ends above anus; the ventral extends to base of first anal spine, its spine 3.9 to 4.1 times in length of head.

The ground color in alcohol yellowish, with a blue spot on each scale of body; some scales on soft dorsal have each a bluish spot; a black ocular band, edged in front and behind with white, descends from origin of dorsal to lower edge of interopercle; the spinous dorsal and anterior portion of soft dorsal are narrowly edged with white and have a very fine submarginal line of blackish; the anal is yellowish and has a rather wide blackish margin on its anterior two-thirds; both caudal and pectoral yellowish; the ventrals a little dusky.

The above account is of four specimens, 29 to 47 millimeters long, collected at Luna and Paraoir, both of La Union Province. This species, previously recorded from Cagayancillo by Jordan and Richardson, occurs throughout the East Indies and southeastward in Polynesia to Tahiti.

McGregor's color notes on the Cagayancillo specimen are as follows:

Color in life, white with greenish wash, each scale with a violet spot; the body white below line of pectoral; scale spots pale yellow on caudal peduncle, base of caudal, and posterior margins of dorsal and anal; a black spot on snout; a dark band from predorsal region through eye to lower margin of gill cover; the band above the eye bordered on each side with pale green; membranes of spinous dorsal light blue at base, light yellow above; anal with terminal black band and subterminal light yellow band, these divided by a narrow pale blue line; caudal light golden yellow; ventral pale pea green, except the two shortest rays; pectorals clear.

Genus CORADION Kaup

Coradion KAUP, Wiegmann's Archiv Naturg. 26¹ (1860) 137 and 146.

The subrhomboid body rounded to angular, with a nearly vertical base for the greater part of the soft dorsal and anal fins; dorsal spines 8 to 10, dorsal rays weak, 25 to 30; anal spines 3, both fins with obtuse rays; the characteristic mouth small, with thick, swollen, plaited lips, the short teeth hardly visible; the preoperculum toothed; the gill rakers weak and in part branched like trees; the lateral line has distinct pores and continues to base of caudal; 45 to 50 scales in a longitudinal series; the posterior margin of caudal convex or straight; the ventral elongate, reaching to second anal spine.

Two species, occurring in the East Indies and eastward to the Bismarck Archipelago. But one is thus far known from the Philippines.

CORADION CHRYSOZONUS (Kuhl and Van Hasselt).

Chaetodon chrysozonus Kuhl and Van Hasselt in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 62; CUVIER, Règne Anim., Poiss. (1817) pl. 38, fig. 2; GÜNTHER, Cat. Fishes 2 (1860) 34; FOWLER and BEAN, Proc. U. S. Nat. Mus. 62 (1922) 55.

Coradion chrysozonus KAUP, Archiv Naturg. 26 (1860) 146; BLEEKER, Atlas Ichthy. 9 (1878) 25, pl. 376, fig. 5; WEBER, Fische Siboga Exp. (1913) 309; AHL, Chaetodontidae, 40, in Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Chaetodon lubiatus Kuhl and Van Hasselt in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 63.

Dorsal IX, 27 to 29; anal III, 20 or 21; there are 37 to 39 scales in a lateral series, 11 or 12 scales between the lateral line and the origin of dorsal, and 21 between the lateral line and the origin of anal.

The depth of the strongly compressed subcircular body 1.3 to 1.5 times in length, the dorsal outline more elevated than the ventral; the head slightly shorter than deep, contained from 2.6 to 2.8 times in length of body, its dorsal profile slightly concave; the caudal peduncle rather deep, 7.7 to 8.5 times in length of body; a bony protuberance near orbit on each side of interorbital space, which is convex and 3.7 to 4.1 times in length of head; the circular eye superior and anterior in head, fairly large, its diameter 3.3 to 4.2 times in length of head; the snout blunt and rather long, 2.6 to 3 times in head; the maxillary contained from 3.8 to 5.2 times in head, and longer than width of preorbital which is greater than two-thirds eye diameter; the mouth very small and horizontal, the jaws equal, the lips thick and arched in front, giving a rounded appearance to mouth when viewed from front; the two nostrils close together in front of each eye, the anterior one a little larger, circular, with a fleshy rim, the posterior part very high, the posterior nostril oval and near edge of orbit; the preopercle distinctly serrated below and behind.

The scales on each side of body moderate in size and in nearly vertical series, those on head, vertical fins, and caudal very small; the lateral line strongly arched, and angular below base of anterior dorsal rays, its posterior end on caudal peduncle; the dorsal spines evenly graduated to the last, which is the highest and contained from 1.2 to 1.5 times in head; the third anal about as long as ventral spine, which is 1.3 to 1.7 times in head;

both the rayed dorsal and anal broadly rounded; the caudal fin very slightly convex; the pectoral fin, which is about as long as last dorsal spine, ends above anus; the ventral is very long and extends to base of anterior anal rays.

In life the ground color is yellowish white, crossed by a wide brownish vertical band on anterior portion of trunk and by another on hind portion; the first band is split above and the second one extends upon the vertical fins; on each side of body, following the longitudinal rows of scales, are narrow, bright lemon yellow stripes, those above lateral line arched upward, those below lateral line nearly horizontal; a deep brown ocular band descends from nape to breast; a deep brown longitudinal band runs along middle of head to tip of snout; the chin deep brown; a deep brown, white-edged ocellus near base of middle dorsal rays; a wide black band, edged in front and behind with white, on base of caudal fin and posterior portion of peduncle, the rest of the fin yellowish; the vertical fins are edged with yellowish white and have a narrow submarginal band of black; the pectoral yellowish white and the ventral blackish.

The ground color in alcohol yellowish brown, the dark portions on head, trunk, and fins blackish brown; the longitudinal light bands whitish; the color of ventrals blackish violet.

The above description is taken from eleven specimens, 47 to 133 millimeters long, from the following localities:

Calapan, Mindoro, 1.	Gigantangan Island, Leyte, a
Bulalacao Bay, Mindoro, 1.	ripe female, 120 millimeters
Masbate Island, 2 specimens,	long, collected February 19,
one a ripe female, 83 milli-	1925.
meters long, collected July 1,	New Washington and Estancia,
1922.	Panay, 3 specimens, one a ripe
Tagapula Island, Samar, a	female, 94 millimeters long,
ripe female, 133 millimeters	collected in July, 1922.
long, collected February 19,	Bantayan Island, 2.
1925.	

Occasionally fine specimens are seen in the Manila market. The first Philippine record of this species is that by Fowler and Bean of a single specimen, 94 millimeters long, from Cebu. It is common on the coast of Java, and is rather rare in other parts of the East Indies. Its northern range extends to the coast of China.

Genus *MICROCANTHUS* Swainson

Microcanthus SWAINSON, Nat. Hist. Fishes 2 (1839) 215.

This genus is separated from *Chætodon* by its smaller scales, having about 55 to 60 in the lateral line. The soft dorsal and

anal are shorter than is usual in *Chætodon*, the fin formula being dorsal X or XI, 17 or 18; anal III, 14 to 16.

A group with apparently but one species.

MICROCANTHUS STRIGATUS (Cuvier and Valenciennes). Plate 18, fig. 1.

Chætodon strigatus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 19, pl. 170; SCHLEGEL, Fauna Japonica, Pisces (1842) 80, pl. 41, fig. 1; GÜNTHER, Cat. Fishes 2 (1860) 34; JORDAN and EVERMANN, Bull. U. S. Fish Comm. 23¹ (1903) (1905) 376.

Dorsal X or XI, 17 or 18; anal III, 14 to 16; there are 53 to 55 scales in a lateral series, 16 between the lateral line and the origin of dorsal, and 24 between the lateral line and the origin of anal.

The body rather deep, short, and compressed, with the back much elevated and anterior dorsal profile from tip of snout to origin of dorsal fin a little concave, the concavity directly above pupil of eye; the depth of body contained from 1.7 to 2 times in length; the head rather small and pointed, a little longer than deep, 2.5 to 2.9 times in length of body; the compressed caudal peduncle deeper than long, its depth 6.8 to 7.2 times in length of body; the interorbital space broad, slightly and evenly convex, 3.2 to 3.8 times in length of head; the diameter of the circular, exceedingly large eye from 2.7 to 3.1 times in head; the snout a little pointed in lateral view and bluntly rounded from top, 3.1 to 3.4 times in head or a little shorter than eye diameter, with the tip on level with lower edge of orbit; the short maxillary contained from 3.4 to 3.8 times in head; the mouth small and terminal with the gape very slightly oblique and the jaws even, small, and a little produced; the teeth sharp, pointed, pungent, and in a rather broad band in each jaw; the entire preorbital about half diameter of eye; the two nostrils close together in front of orbit and both provided with a rather low marginal flap, the anterior one rather small and circular and the posterior one a short slit; the preopercle very distinctly serrated behind, at its angle and on posterior portion of lower edge; all other opercular bones entire.

The scales rather small, weakly ctenoid, those on soft vertical and caudal fins very small; there are also small scales at base of pectoral and ventral fins; the lateral line very distinct, evenly arched to caudal peduncle, and then straight to base of caudal fin; the dorsal spines decrease in height from third or fourth, which is about two-thirds length of head; third anal spine longest, 1.6 to 1.9 times in length of head; the anterior dorsal and anal rays highest; the caudal fin concave, with

the lobes slightly pointed; the pectoral is rather small, a little shorter than ventral, or 1.4 to 1.6 times in head, and ends about the width of eye before anus; the outer ray of ventral is a little produced and extends to anus.

In alcohol the ground color yellowish; there are six dark brown, rather broad horizontal bands on each side of body, the first one of which is on spinous dorsal and anterior rays; the second one runs along base of dorsal spines and across middle of soft dorsal; the third is along back and posterior dorsal rays; the fourth commences at occiput and ends at middle of caudal fin base; the fifth begins above eyes and crosses body to posterior portion of anal; the sixth runs from tip of snout to base of pectoral, thence to base of anal spines and on anterior rays; both pectoral and caudal fins light brown; the ventrals light brown at base, their outer portions blackish; there is a narrow whitish margin to both soft dorsal and anal.

Here described from four examples, 34 to 112 millimeters long, taken at Amoy, Dodd Island Lighthouse near Amoy, and Hongkong.

This species, which probably occurs in the northernmost Philippine islands is known thus far only from the seas of China and Japan, and from the Hawaiian Islands.

Genus *HEMITAURICHTHYS* Bleeker

Hemitaurichthys BLEEKER, Syst. Percarum revisum, Arch. Neerl. Sci. Nat. 11 (1876) 304.

Dorsal XI or XII, 24 or 25; anal III, 19 to 21; lateral line 60 to 75.

Body elliptical or oblong, with pointed head, the lateral line arched high along back, descending after the middle and continued upon caudal peduncle; angle of preoperculum somewhat extended and feebly serrate; snout slightly produced, teeth small, brushlike; caudal gently rounded or truncate.

Close to *Heniochus* but easily distinguished by the dorsal spines, none of which are lengthened; distinguished from *Chætodon* by the larger number of scales in horizontal rows; it differs from *Microcanthus* in the larger number of soft dorsal and anal rays, the weaker teeth, and the finer serration of the preopercle.

Two species, one from Mauritius, the other East Indian.

HEMITAURICHTHYS POLYLEPIS (Bleeker).

Chætodon polylepis BLEEKER, Act. Soc. Indo-Neerl. 2 (1857) Achtste Bijdrage Vischfauna Amboina, 54; GÜNTHER, Cat. Fishes 2 (1860) 25.

Tetragonopterus polylepis BLEEKER, Ned. Tijds. Dierk. 1 (1863) 70.
Hemitaenichthys polylepis BLEEKER, Atlas Ichthy. 9 (1877) 30, pl.
16, fig. 4; AHL, Chaetodontidae, 37, in Archiv für Naturg. 89
(1925) Abt. A, Heft 5.

Dorsal XII, 24 to 26; anal III, 21; 60 to 68 scales in lateral line, 14 between lateral line and origin of dorsal, and 30 to 33 between line and origin of anal.

Body very deep and strongly compressed, with the dorsal outline more elevated than the ventral; depth contained from 1.5 to 1.6 times in length; the head, which is pointed in front, about as long as deep, 3 to 3.1 times in length of body, its dorsal profile very steep and a trifle concave before the interorbital space; depth of caudal peduncle 8.4 to 9 times in length of body; interorbital space strongly convex, its least width 3 times in head; the circular eye situated about midway between tip of snout and a vertical through posterior margin of opercle, its diameter 3.2 to 3.3 times in head; snout pointed and longer than eye, 2.6 to 2.7 times in head or 1.6 to 1.7 times maxillary; width of preorbital at angle of mouth 4.6 to 4.8 times in head; mouth small and horizontal, with the jaws about even; two nostrils in front of each eye, the anterior one rounded and having a deep fleshy flap behind, the other a small simple slit; preopercle finely serrated at its hind and inferior margins.

The scales covering trunk small, those on head and fins very small to minute; the lateral line is deeply arched and extends to base of caudal fin; the middle dorsal spines higher than the others, third anal spine 1.5 times in head; both rayed dorsal and anal broadly rounded; caudal truncate; pectoral slightly longer than head, 2.9 to 3 times in length of body; the ventral fin is as long as the pectoral and extends to base of anal spines, its spine slightly greater than half its length or 1.6 to 1.9 times in head.

Fresh specimens were pearl gray on belly, sides, and caudal, the gray forming a triangle with its apex at base of seventh to ninth dorsal spines and running down to origin of pectoral and anterior extremity of caudal peduncle; a brilliant yellow triangle on upper anterior part of body, its base from third to sixth or seventh dorsal spine, its apex extending to or nearly to origin of pectoral; a broad, convex, brilliant yellow band, including the three posterior dorsal spines, base of soft dorsal and part of upper posterior part of trunk, extends down to origin of caudal peduncle; everything before a line from second dorsal spine to the ventrals yellowish olive brown; a brilliant yellow

band on basal half of anal; first two dorsal spines olive brown; rest of dorsal spines and anal spines bright yellow; pectorals, ventrals, caudal, and outer parts of soft dorsal and anal all uniform pearl gray.

Here described from nine handsome specimens, 110 to 121 millimeters in length, collected on a reef at Quiminatin Island, a southern outpost in the Sulu Sea of the Cuyo Islands.

This uniquely marked fish has hitherto been reported only from Amboina, Timor, and New Guinea.

Genus HENIOCHUS Cuvier

Heniochus CUVIER, Règne Anim. 2 (1817) 335.

This genus is especially distinguished by its greatly compressed and elevated body; bony projections or horny spines, often curved and sharp pointed, are developed above the eyes, their number and size varying greatly with age in the different species, in some very prominent in early maturity and decreasing with advancing years, in others growing larger with old age; the dorsal spines vary from 11 to 13, the fourth elongated, in some species excessively so, with threadlike tip; the concave snout short or of only moderate length, the preopercle unarmed or serrate; the scales of moderate size; an air bladder present; there is a small number of pyloric appendages; branchiostegals 5; teeth villiform, none on palate.

The singular form, remarkable streamers, strongly contrasting colors, and stately carriage of these fishes excite the admiration of every beholder. They are among the most attractive of aquarium fishes.

A small genus, occurring from Mauritius to the South Sea Islands and Hawaii, and carried north to Japan by the Kuro-Siwo. The species are few in number, all characterized by broad crossbands. The genus is close to *Chætodon*, but easily distinguished by the elongated fourth dorsal spine.

Key to the species of *Heniochus*.

*a*¹. Body with two black transverse bands on each side.

H. acuminatus.

*a*². Body with three or more black bands on each side.

*b*¹. Two black transverse bands on each side of head.

H. singularius.

*b*². Only one black transverse band on each side of head.

*c*¹. The black band on head descending to chin and breast; the third band, rather indistinct, entirely on the rayed dorsal.

H. varius.

- c². The black band on head descending to belly; the third band running from the last five dorsal spines to root of caudal fin, covering base of dorsal rays.

H. permutatus.

HENIOCHUS ACUMINATUS Linnæus. Plate 19, fig. 2.

Chætodon acuminatus LINNÆUS, Syst. Nat. ed. 10 (1758) 272.

Heniochus acuminatus CUVIER and VALENCIENNES, Syst. Nat. Hist. Poiss. 7 (1837); JORDAN and EVERMANN, Fishes of Hawaii, Bull. U. S. Fish Comm. 23¹ (1903) (1905) 376, pl. 55; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1906) 97.

Chætodon macrolepidotus LINNÆUS, Syst. Nat. ed. 10 (1758) 274; BLOCH, Ichtyologie 6 (1788) 50, pl. 200, fig. 1.

Heniochus macrolepidotus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 70; SCHLEGEL, Fauna Japonica, Poiss. 82 (1842) pl. 44, fig. 1; GÜNTHER, Fische der Südsee 1 (1873-1875) 48, pl. 37; DAY, Fishes of India (1878) 110, pl. 28, fig. 3; MEYER, Ann., Soc. España Hist. Nat. 14 (1885) 17.

Taurichthys macrolepidotus BLEEKER, Atlas Ichthy. 9 (1878) 29, pl. 367, fig. 1.

Dorsal XI or XII, 23 to 25; anal III, 17 to 19; there are 50 to 57 scales in the lateral line; 11 or 12 between the lateral line and the origin of dorsal, and 21 to 23 from the lateral line to the origin of anal.

The anterior dorsal profile almost an even curve from posterior portion of interorbital to origin of dorsal; the interorbital space strongly convex, with a bony projection on each side, which becomes prominent with age; the greatest depth of body above base of ventrals, 1.3 to 1.5 in total length; the head rather small, 2.6 (2.2) to 3 in length; the diameter of eye greater than width of interorbital and 2.8 to 3.6 in length of head; the snout longer than eye, 2.7 to 3.3 in head; the orbit has on its margin fine serrations which are more distinct in older specimens; the preopercular edges finely serrated; the opercle armed posteriorly with a flat, rather pointed spine.

The fourth dorsal spine the longest, produced into an exceedingly long filament which extends beyond tip of caudal; both second and third anal spines of nearly same length, the former much the stronger; the soft dorsal lower and much more rounded than the soft anal; the ventral fin extends beyond anus, its spine almost equal to length of head from tip of snout to hind edge of preopercle; the pectoral fin just touches a vertical passing through anal opening.

The ground color in alcohol yellowish white; two black bands cross body obliquely backward; the anterior band runs from first four dorsal spines to ventrals, belly, and tips of anterior half

of anal, touching posterior margin of opercle and root of pectoral; the second band is between the sixth and the tenth dorsal spines and the posterior half of soft anal, covering behind a small part of caudal peduncle; the dorsal rays, caudal, and free portion of pectoral lemon yellow; the base of the pectoral rays, the ventrals, the interorbital space above eyes, the upper surface of preorbital, and lips black; rest of body yellowish white.

Thirty-four specimens, ranging in length from 35 to 178 millimeters, were collected from the following localities:

Subic Bay, Zambales, 2.	Gato Island, and Cebu, Cebu
Puerto Galera, Mindoro, 1.	Province, 2 each.
Calapan, Mindoro, 13.	Buenavista, Guimaras, 2.
Gaspar Island, Marinduque, 5.	Jolo, Sulu Province, 5.
Bennett Island, Masbate, 2.	

This species has been recorded from Manila by Cuvier and Valenciennes and by Bleeker; from Cebu, Cebu Province, by Meyer, and from Bacon, Sorsogon, and from San Fabian, Pangasinan, by Evermann and Seale.

It is found from the east coast of Africa, east to northern Australia, and north to Japan and Hawaii.

HENIOCHUS SINGULARIUS Smith and Radcliffe. Plate 18, fig. 2.

Heniochus singularius SMITH and RADCLIFFE, Proc. U. S. Nat. Mus. 40 (1911) 321, fig. 2; AHL, Chaetodontidae, 28, Archiv für Naturg. 89 (1893), Abt. A, Heft 5.

Dorsal XII, 26; anal III, 18; there are 58 scales in the lateral line; 12 between the lateral line and the origin of dorsal; 26 from the lateral line to the origin of anal. According to Smith and Radcliffe the scales are $11 + 26 - 50$. Our specimen also has one more dorsal and anal ray than the number they give.

The upper profile of body has in front a small horn, directly above eyes; from this horn to origin of dorsal the profile is almost straight and from horn to tip of snout it is concave; body depth 1.5 times, head 3 times in length, the slightly convex interorbital space is 4 times in head, and has a bony projection over each eye; the snout rather long, 2.5 in head; the small circular eye 3.8 in head, its diameter slightly greater than the width of interorbital space; the edges of preopercle weakly denticulated; a rounded flat spine at posterior end of opercular bone.

Fourth dorsal spine longest, 2.2 in length of body and having a wide membrane behind; second and third anal spines nearly the same length, being equal to distance from tip of snout to vertical edge of preopercle; the tip of ventral does not extend to anus; the soft dorsal lower and more rounded than the soft anal, the middle rays of both fins highest.

Two small black bands, separated from each other by a narrow pearly white crossbar which extends from front of eyes to throat, encircle head just before posterior edge of eye; the first band encircles mouth and extends upward to nostrils, thus partly covering preorbital, and the second extends from top of head across eye, preopercle, and part of orbital ring to subopercle; the rest of body covered by alternating bands, the first one of which is yellowish silvery and descends from front of dorsal to throat; the second band of black covers almost all of trunk, ventrals and anal, and extends from the vertical through the insertions of dorsal and ventral to caudal peduncle, leaving a lighter area, widest ventrally and almost completely absorbed in the black, which extends downward from third to fifth dorsal spines to belly and anal; a well-defined yellowish white band covers caudal, a small part of caudal peduncle, the dorsal rays, and the upper portion of posterior dorsal spines; the pectoral black at base and yellowish white on the rest of the fin; lips yellowish white.

The above account is based upon the only specimen in the Bureau of Science collection. It was taken on the southern coast of Batangas Province by Japanese fishermen, and measures 184 millimeters in length. Since this was written a fine specimen, 204 millimeters in length, was collected at Quiminatin, one of the Cuyo Islands.

There is no question that the example at hand is identical with *Heniochus singularius* Smith and Radcliffe. This species is very closely related to *Heniochus varius* (Cuvier and Valenciennes), and a large series in all the growth stages might show their identity.

According to Smith and Radcliffe, the color in life is as follows: Upper portions of silvery bands on head, before described, slightly dusky, with a faint brassy wash; first and second dorsal spines black; third spine gray, the color continued as a lighter band diagonally across the black coloration of trunk to middle of anal; centers of scales on darker ventral portions of trunk somewhat pearly or purplish margined with darker brown; scales under posterior portion of dorsal black,

particularly about margins, the centers with a steel bluish area, which becomes smaller toward base of anal; dorsal from tip of fifth spine to base of sixth and diagonally along its basal edge, including upper and hinder portion of caudal peduncle, and all of caudal fin, cadmium orange; front and posterior margins of anal purplish black; base of pectoral, including base of rays and all of the scaled portion, blackish, the remainder lemon yellow; ventrals black.

This species was obtained by Smith and Radcliffe on the Albatross Expedition from the following Philippine localities: Lagonoy and Ragay Gulfs, Luzon; Port Dupon, Leyte; Murcielagos Bay, Mindanao; and Ulugan Bay, Palawan. They also obtained it from Soo Wan, Formosa: Si Amil Island, eastern Borneo; Gulf of Tomini, Celebes; and Gilolo.

HENIOCHUS VARIUS (Cuvier and Valenciennes). Plate 20, fig. 2.

- Taurichthys varius* CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 111, pl. 181; CUVIER, Règne Anim. Disciples' ed. 7 (1836) 109, pl. 41, fig. 2; BLEEKER, Atlas Ichthy. 9 (1878) 27, pl. 365, fig. 2; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1907) 97.
Heniochus varius GÜNTHER, Cat. Fishes Brit. Mus. 2 (1860) 41; AHL, Chaetodontidae, 24, Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Tao Sug name, *kabubu*.

Dorsal XI, 23 to 26; anal III, 17 or 18; there are 58 to 60 scales in the lateral line; 12 between the lateral line and the origin of dorsal, 24 to 26 from the lateral line to the origin of anal.

The dorsal profile has in front a hornlike projection which makes a concave outline with upper portion of head; depth 1.4 to 1.5 times, the small head 2.7 to 3.4 times in length; the interorbital space convex, 3.9 to 4.2 in head; over each eye is a very stout, long, sharp, outwardly curved, projecting spine, which may or may not have serrations on its hind side; there may or may not be strong serrations on upper and anterior portions of orbital margin; the snout 2.5 to 2.7 (exceptionally 3.6) in head, longer than eye, more concave in younger specimens; the circular eye 3 (2.8) to 3.3 (3.8) in head, its diameter shorter than snout; the opercle has a pointed flat spine behind; both the vertical and inferior limbs of preopercle finely serrated.

The fourth dorsal spine longest, 2.1 (1.5) to 2.3 times in length of body, with a filamentous tip and a wide membrane behind; the second and third anal spines nearly equal in length, the

former much the stronger; the soft dorsal lower and more rounded than the soft anal; in the youngest specimen ventral extends to beyond base of anal spines, and in the oldest it scarcely reaches anus; the ventral spine equal to or slightly shorter than distance between snout and vertical limb of preopercle.

In alcohol the ground color yellowish white; a black band descends from front of dorsal and top of head to chin and throat, covering anterior two-thirds of sides of head; a second, very broad black band extends from third to seventh dorsal spines to underpart of body, reaching from root of ventrals to caudal peduncle and covering almost completely the sides, ventrals, and anal; a dark portion, which is a rather indistinct third band, is present on the dorsal fin rays; the base of pectoral black, rest of fin yellowish white; the caudal fin also yellowish white.

A specimen having only eleven dorsal spines has the fifth one the longest and the first one pointed forward.

We have studied eight specimens in the Bureau of Science collection. They measure from 107 to 141 millimeters in length and were obtained on the southern coast of Batangas Province; Calapan and Bulalacao Bay, Mindoro Province; Guindulman, Bohol; and Cagayan de Misamis, Mindanao.

The species occurs in Samoa and the East Indies, where it is common about the reefs.

HENIOCHUS PERMUTATUS Bennett. Plate 22, fig. 2

Heniochus permutatus Bennett in CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 75.

Heniochus chrysostomus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 75; Valenciennes, Poissons in CUVIER, Règne Anim., Disciples' ed. 8 (1836) pl. 40, fig. 2; LAY and BENNETT, Fishes, Voy. Blossom (1839) 62, pl. 18, fig. 1; GÜNTHER, Cat. Fishes Brit. Mus. 2 (1860) 41; Fische der Südsee 1 (1873-1875) 49, pl. 39, fig. A; STEINDACHNER, Sitzungsab. Wien 102, Abt. 1 (1893) 226, pl. 2, fig. 1; AHL, Chaetodontidae, 30, Archiv für Naturg. 89 (1923) Abt. A, Heft 5.

Taurichthys chrysostomus BLEEKER, Atlas Ichthy. 9 (1878) 29, pl. 366, fig. 4.

Dorsal XII, 22; anal III, 18; there are 52 scales in the lateral line, 11 between the lateral line and the origin of dorsal, and 22 to 25 from the lateral line to the origin of anal.

The dorsal profile nearly vertical in its upper part which extends forward over middle of eye; the small protuberant snout

concave above; the greatest depth over base of ventrals, 1.5 to 1.6 times in length; the head small, 2.8 to 3 in length; the interorbital space nearly flat, 1.4 times in eye, with a short, sharp, outwardly pointed spine over each eye; in front of this spine is a trace of another, and behind are fine serrations on rim of orbit above eye; the circular eye is rather large, approximately 2.8 to 3 times in head, and equals snout; the opercle ends posteriorly in a sharp flat spine; the vertical limb of preopercle produced posteriorly and slightly serrated; the caudal peduncle small, its depth less than eye.

The fourth dorsal spine elongated, its length nearly two-thirds that of body, with filamentous tip and a wide membrane behind; the second and third anal spines nearly equal in length, the former much the stronger; the longest dorsal rays 1.4 times in the length of the longest anal rays; the pectoral is longer than head and extends as far as above second anal spine; the ventrals reach beyond anus.

Color in alcohol yellowish white with three transverse, somewhat curved, black bands descending obliquely backward, the first one from top of head and front of dorsal to belly, completely covering eye, upper portion of preopercle, opercle, base and axil of pectoral fin, and ventrals; the second from fourth to sixth dorsal spines down to anal rays; the third extends from the last five dorsal spines and covers base of dorsal rays and adjacent portion of body to or across root of caudal; the pectoral, soft dorsal rays, first three dorsal spines, anal spines, and caudal like body in color; the interorbital space and top of snout blackish.

We have but three specimens, 92 to 130 millimeters long, taken at Romblon, Romblon Island; and Tubigan and Bungau Islands, Sulu Archipelago.

This species is known to occur, although not abundantly, in the Moluccas, New Guinea, Tahiti, Samoa, and Woodlark Island.

Genus *HOLACANTHUS* Lacépède

Holacanthus LACÉPÈDE, Hist. Nat. Poiss. 4 (1803) 525.

Genicanthus SWAINSON, Class. Fishes 2 (1839) 212.

Centropyge KAUP, Wiegmann's Archiv 26 (1876) 138.

Acanthochætodon BLEEKER, Arch. Neerl. Sci. Nat. 12 (1876) 5.

Chætodontoplus BLEEKER, Arch. Neerl. Sci. Nat. 12 (1876) 26.

Common names.—English, angel fish; Tao Sug and Samal, *kabubu*, *teiro*; Visayan, *alibang-bang*, *boray-boray*, *tapay-tapay*.

This genus is distinguished at once from all other chaetodonts by the long, stout, usually grooved preopercular spine; the body is oval to subrhomboid, often robust, not greatly compressed; the scales are rather small, hard, ctenoid, longitudinally corrugate, often mixed with smaller ones; the head everywhere scaled; the vertical limb of preopercle has small equal serrations; the interopercle short, armed with 1 to 4 strong spines; the dorsal continuous, not notched, the spinous portion longer than the soft; dorsal spines 8 to 15, strong, usually graduated, increasing in height to the last; the soft dorsal with 15 to about 30 rays, usually rounded, sometimes angulate or pointed or the angle elongated into a filament; anal spines 3, the third one longer than the others, the rays 16 to 25, shaped like soft dorsal.

The members of this genus are among the most beautiful of living creatures. They vary in size, some of them becoming very large. They abound about coral reefs, usually at some depth; now and then some gorgeously colored specimen appears from the darkness below, sails majestically about for a time, and disappears in the caverns beneath. Some holacanthids are notable for their vivid hues, others in quieter garb have a richness and delicacy of coloration unsurpassed by the most beautiful of tropical butterflies. The larger species are prized for food, though rarely marketed.

Key to the Philippine species of Holacanthus.

- a*¹. Scales of moderate size, 35 to 50 in lateral series.
 - b*¹. Body with 3 to 5 longitudinal black bands; a yellow spot on nape; caudal and anal spotted with black..... *H. lamarcki*.
 - b*². Body without longitudinal bands.
 - c*¹. Body with 6 to 10 vertical crossbands.
 - d*¹. Dorsal with 13 spines.
 - e*¹. Body with 6 dark blue or violet-black bands; a pearl white band from nape to opercular spine behind eye.
 - H. sexstriatus*.
 - e*². Ten dark brown bands, the first through eye.. *H. multifasciatus*.
 - d*². Dorsal with 14 spines; body with 7 to 9 bluish bands, edged with violet-black, continued on dorsal; anal with longitudinal bluish bands *H. diacanthus*.
 - c*². Body without crossbands.
 - f*¹. Trunk with a large, vertical, pearl white spot near its middle.
 - H. tibicen*.
 - f*². Body bicolored, or uniform, or spotted.
 - g*¹. Body bicolored.
 - h*¹. Anterior portion of body and caudal yellow; rest of body black, sharply defined; soft dorsal and anal elongate, pointed; dorsal spines 15..... *H. bicolor*.

- h*². Head and anterior two-thirds of body grayish brown, gradually passing into violet-black on posterior third; a large black blotch on hind margin of opercle; soft dorsal and anal rounded; dorsal spines 14..... *H. vroliki*.
- g*². Body spotted.
- i*¹. Body orange brown with a dark blue ocellated spot on each side of nape and one on each shoulder..... *H. trimaculatus*.
- i*². Body deep orange yellow, each scale with a blue spot; head blue with yellow ocelli and bands on sides of head; a large black ocellus on posterior part of dorsal.
H. xanthometopon.
- a*². Scales small, 75 to 95 in lateral series.
- j*¹. Body banded.
- k*¹. Body with many longitudinal, yellowish, slightly waved stripes.
H. imperator.
- k*². Body with white curved transverse lines.
- l*¹. Scales 85 to 88; posterior line forming a complete ring; no longitudinal white line on middle of forehead..... *H. nicobariensis*.
- l*². Scales 75; lines curved, concentric, not forming a ring; a longitudinal white line from nape to tip of snout.
H. semicirculatus.
- j*². Body not banded.
- m*¹. Dorsal spines 12 or 11; head and belly lemon yellow, shading to violet-brown or blackish on rest of body; sides with many irregular, wavy, longitudinal, blue lines; a brown ocular band from nape to breast..... *H. mesoleucus*.
- m*². Dorsal spines 14; accessory scales present; olive brown, darker anteriorly and posteriorly; each scale with a bluish or blackish spot; dorsal, anal, and caudal with pearly spots.

H. lepidolepis.

HOLACANTHUS LAMARCKI Lacépède. Plate 16.

Holacanthus lamarcki LACÉPÈDE, Hist. Nat. Poiss. 4 (1798) 526, 532;
CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 148, pl. 184;
BLEEKER, Atlas Ichth. 9 (1878) 59, pl. 371, fig. 4.

Dorsal XV, 15; anal III, 18; there are 45 scales in the lateral line, 7 between the lateral line and the origin of dorsal, and 23 between the lateral line and the origin of anal.

The laterally compressed body oblong-ovate, thick anteriorly but thin posteriorly, dorsal profile convex but with a depression before eye, anterior ventral profile convex; the depth of body twice, the head 3.7 times in length; the depth of head greater than its length; the eye 3.9 times in head, 1.2 times in snout, and 1.33 times in the convex interorbital space; the blunt, nearly vertical snout 3.18 times in head, the interorbital 2.9 times; the mouth small, horizontal, jaws equal, the preorbital partially conceals maxillary; it has two stout forward-pointed spines and its lower and posterior margin is strongly toothed; the maxillary 4.1 times in head; the nostrils close together, midway

between eye and tip of snout, and directly in front of center of eye; the anterior nostril small, with a subtubulate margin which is elongate behind; the open posterior nostril larger; the posterior margin of preopercle diagonally inclined downward and forward, its posterior margin more or less coarsely serrate and terminating in a strong spine which is 1.55 times snout and a little more than twice in head.

The head, vertical fins, and caudal densely covered with small to minute scales; the regularly disposed scales of body moderately large except on breast, where they are much smaller; the conspicuous lateral line extends to base of caudal; the base of spinous dorsal more than twice as long as that of soft dorsal; the last dorsal spine equals snout and eye together; the dorsal rays longer than the dorsal spines, the middle rays longest, acutely angulate; the anal shaped like soft dorsal, its angulate portion of equal length; the upper and lower marginal lobes of caudal prolonged into filaments, the total length of caudal 3 times that of head; the pectoral a little shorter than head.

The color violet-brown above, merging into sea green or blue-green on sides, pale below, with a dilute roseate flush over all, becoming light rose on breast and cheeks; 5 longitudinal black bands, the first 2 starting from eye, the next 2 on cheek below eye, all 4 pursuing a slightly irregular course, breaking into spots posteriorly and terminating on base of caudal; the fifth line short, extending from beneath pectoral to a point above middle of anal; a yellow spot on nape; a broad deep black band includes the 4 anterior dorsal spines and passes back to angle of soft dorsal as a broad black margin; the anal and caudal covered with small black spots; the ventrals deep black; the eye yellow. In alcohol the rose and green largely disappear, and the green spots on the lateral scales change to pearl color.

Here described from a specimen, 130 millimeters long, collected on the coast of Tablas.

This unique species hitherto has been known only from the Moluccas. According to the early Dutch writers on the Moluccan fauna this fish is highly prized, its flaky flesh having a very agreeable flavor.

HOLACANTHUS SEXSTRIATUS (Kuhl and Van Hasselt) Cuvier and Valenciennes.

Holacanthus sexstriatus (Kuhl and Van Hasselt) CUVIER and VAL-
ENCIENNES, Hist. Nat. Poiss. 7 (1831) 145; GÜNTHER, Cat. Fishes

2 (1860) 49; KNER, Zool. Reise Novara, Fische (1865) 104; BLEEKER, Atlas Ichth. 9 (1878) 66, pl. 372, fig. 1.

Dorsal XIII, 20; anal III, 18; there are 50 scales in a lateral series, 9 between the lateral line and the origin of dorsal, and 30 between the lateral line and the origin of anal.

The body oval, deep and compressed, its depth contained 1.7 to 1.8 times in length; the head a little shorter than deep, 2.1 to 2.2 times in depth of body, its upper profile steep and very slightly arched to upper end of maxillary; the depth of caudal peduncle 6.7 to 7.5 times in length of body or almost twice in that of head, and less than twice its own depth; the circular eye contained from 4 to 4.7 times in length of head or about twice in that of snout, which is 2.3 to 2.4 times in head; the interorbital space strongly and evenly convex, rather wide, being 2.9 to 3.2 times in head; the maxillary much shorter than snout and from 3 to 3.5 times in head; the mouth small and oblique, with the upper jaw narrowly slipping behind into a groove under anterior edge of preorbital; the preorbital provided with a few small but strong blunt teeth at its widest portion, which is as wide as interorbital space; the anterior nostril is a very small rounded opening, with a marginal flap all around except at anterior border, and leads into the same cavity as the exceedingly large oval posterior nostril. One specimen is abnormal, having two small anterior nostrils on the right side of head, in front of the much larger posterior one; the other side is normal; the preopercle is evenly serrated behind, armed below with small, widely separated teeth, and has at its angle a long, stout, slightly curved spine, which is twice in length of head; opercular margin entire.

The scales large and regular, those on head and fins small to minute; there are no accessory scales anywhere on body except a few on breast; the lateral line is very distinct and ends at base of caudal fin; the dorsal spines progressively higher to the last, which is twice the length of snout; the posterior margin of soft dorsal almost forms a right angle with upper margin; the anal rounded posteriorly, the caudal convex; the short pectoral longest superiorly and about as long as last dorsal spine, its posterior margin within three scales of anus; the ventral fin is longer than the pectoral by an eye diameter and reaches origin of anal, its spine 1.4 in head.

The life color yellowish brown with a large dark blue center to each scale of body, leaving a light edge which forms the ground color; across the dark blue head there is a broad pearl

white vertical band descending from nape to base of opercular spine, passing between eye and posterior preopercular margin; the body crossed by six dark blue vertical bands; the preopercular spine and the dorsal spines blue; the vertical and caudal fins yellowish brown with a bluish margin, a submarginal border of blue-black and many good-sized circular bluish white spots thickly sprinkled upon soft dorsal, anal, and caudal.

In alcohol the ground color has become yellowish; the head, breast, all the fins, and the vertical bands across body have turned violet-black; the pearl white band on head has become dull white; the bluish white spots and external margins on vertical and caudal fins are still present, and the submarginal border of blue-black is rather conspicuous; each scale of body blackish, leaving a whitish or yellowish border.

We have studied four examples, 167 to 300 millimeters long, collected at Ambil Island in the China Sea, southwest of Manila Bay and just north of Lubang Island; Tagapula Island, Samar; Bantayan Island, Cebu; and Tandubas Island of the Tawitawi group, Sulu Archipelago. A very large specimen was seen at Cebu but the fisherman refused to sell it, saying he wished to eat it.

This species, not heretofore reported from the Philippines, is easily recognized by the presence of thirteen dorsal spines, the pearl white crossband on each side of head, and the six dark vertical bands across body. It reaches a length of at least half a meter and is said to be the largest *Holacanthus*. It is only known from the East Indies.

HOLACANTHUS MULTIFASCIATUS Smith and Radcliffe. Plate 17, fig. 2.

Holacanthus multifasciatus SMITH and RADCLIFFE, Proc. U. S. Nat. Mus. 40 (1911) 324, fig. 3.

Dorsal XIII, 17; anal III, 16; scales in lateral line 46, in transverse series $7 + 22$; 30 rows between opercle and end of last vertebra.

The general form elliptical, the body compressed, the depth 1.55, the head 3.25 times in length; the upper profile steep, somewhat sinuous but nearly straight; the snout short and blunt, 2.75 times, the eye 3.1 times, the flattened interorbital 3.5 times in head; the mouth small, terminal; the preorbital armed with several strong, sharp denticulations; the anterior nostril has a posterior flap, the posterior nostril is elliptical; the vertical limb of preopercle has well-developed denticula-

tions; the spine at the angle is strong, curved, longer than snout; two weaker spines on the horizontal limb; the scales regularly arranged, those on middle of side larger than the others; vertical fins and head finely scaled; the dorsal spines slender, curved, the fifth longest, 1.46 times in head; the membranes of the anterior spines deeply incised; the soft dorsal higher than the spinous dorsal, evenly rounded; anal similar to soft dorsal; the caudal short, the tip rounded; the ventrals 2.65 in length, the first ray filamentous, its tip reaching base of second anal spine; pectoral slightly longer than head.

Color in life: Ground color pearl gray, paler below, crossed by ten dark brown bands merging into orange ventrally, bands slightly wider above than below, slightly narrower than eye in widest part, and about equal to interspaces; the first or ocular band is orange below eye; there is an orange ring about mouth, the snout and chin dusky; a short brown stripe between the eyes; a black blotch near middle of brown margin of soft dorsal; bands on anal mostly orange; ventrals cadmium yellow, the produced tip white; pectorals hyaline.

Color in alcohol: Dusky cream, crossed by ten seal brown, somewhat curved crossbands about as wide as the interspaces; the first or ocular band slightly narrower than eye, crosses nape in front of dorsal and extends downward across base of preopercular spine, fading out on breast; second band extends from first and second dorsal spines downward across posterior border of opercle and pectoral base, traces reaching behind base of ventral; third to eighth bands begin on spinous dorsal, the seventh and eighth crossing anterior basal portion of soft dorsal, and extend downward across base of anal; ninth band crosses tips of last two dorsal spines, middle of soft dorsal rays, anterior part of caudal peduncle, and middle of anal rays; tenth band crosses upper third of soft dorsal, base of caudal peduncle, and posterior third of anal; traces of another band on tip of soft dorsal rays, base of caudal, and tips of anal rays; a short median stripe on top of head, widest between eyes; traces of a dusky brown band around mouth; caudal with five crossbands, the first complete, the others successively more broken; anal spines and ventrals white; pectoral dusky.

The Albatross Expedition obtained specimens at Puerto Galera, Mindoro, and Romblon, in the Philippines, the type, 93 millimeters long, coming from the first-named locality. Other specimens were collected at Mabul Island, Borneo; at four

islands in Tomini Gulf, Borneo; and Bouro, Talisse, and Uki Islands in the Dutch East Indies.

The above description is compiled from Smith and Radcliffe's account, as we have not found this little *Holacanthus*.

HOLACANTHUS DIACANTHUS (Boddaert). Plate 21, fig. 2.

Chætodon diacanthus BODDAERT, *Efist. de Chaetodonte diacantho descripto* (1772) *Schrift, Ges. Naturf. Freunde, Berlin* 3 (1782) 459.

Holacanthus diacanthus GÜNTHER, *Cat. Fishes* 2 (1860) 48; *Fische der Südsee* 1 (1873) 50, pl. 40, fig. A; BLEEKER, *Atlas Ichthy.* 9 (1878) 65, pl. 348, fig. 5; JORDAN and SEALE, *Bull. Bur. Fisheries* 25 (1905) (1906) 347.

Chætodon fasciatus BLOCH, *Ichthyologie* 6 (1788) 39, pl. 195 (figure very poor).

Holacanthus dux LACÉPÈDE, *Hist. Nat. Poiss.* 4 (1803) 534; CUVIER and VALENCIENNES, *Hist. Nat. Poiss.* 7 (1831) 138.

Dorsal XIV, 20; anal III, 18; there are 44 scales in a lateral series, 8 between the lateral line and the origin of dorsal, and 27 between the lateral line and the origin of anal.

The body oblong-ovate, with the dorsal and ventral profiles about equally elevated, its depth contained 2.1 times in length; the head, which is as long as deep, 3.3 times in length of body, its upper profile slightly concave in front of eye and gently arched above it toward dorsal fin; the depth of caudal peduncle less than twice its length, 8.7 times in length of body; the almost flat interorbital as wide as the diameter of the high, circular eye, which is 3.8 times in length of head; the snout rather pointed and long, 2.4 times in head; the maxillary much shorter than snout and contained 3.4 times in head; the mouth small and horizontal, with the jaws even and maxillary partly covered by anterior portion of preorbital; the preorbital armed with small teeth on its lower edge and almost equal to an eye diameter at its widest part; in front of eye are two nostrils, the slightly larger one behind a simple oval opening, and the anterior one surrounded by a very short membranous tube which is extended behind into a very wide flap; the preopercle is coarsely denticulated behind and has at its angle a stout, slightly curved spine, which is a little shorter than eye; in front of this spine along lower edge of preopercle are several small, sharp teeth; opercular margin not serrated.

The scales moderately large and regular in size and shape, those on trunk in regular transverse lateral series; there are no accessory scales; the conspicuous lateral line ends at posterior third of soft dorsal; the dorsal spines evenly

graduated to the last, which is the longest and contained about twice in depth of body; the rayed dorsal and anal fins rounded and about equal in height; the caudal fin strongly convex; the pectoral, which is longest superiorly, ends before anal opening; the ventral is slightly produced and extends behind as far as anus.

In alcohol the ground color yellowish, with ten bluish transverse bands, each broadly edged with violet-black; the first eight bands continued on dorsal; the ninth across caudal peduncle; the tenth across base of caudal fin; on anal are several bluish streaks, which run parallel to base of fin; caudal entirely yellowish; there are two transverse bands, edged with violet-black on each side of head, one behind orbit and the other in front of it; running along middle of forehead is another band similarly colored.

The single specimen above described is a ripe female, 122 millimeters long, collected at Romblon in August, 1922.

Since writing the above a specimen, 157 millimeters long, was obtained at Bantayan Island. In life the upper half of body is brilliant orange, merging into lemon yellow ventrally and on caudal, the body crossed by ten wide, curved, pale blue bands, each surrounded by a thick brownish black stripe; the bands extend above upon dorsal, the black borders extend back as longitudinal lines on fin; a blue-black-edged stripe extends from first transverse band to nape and down to and around behind eye, terminating beneath it; another blue line begins lower down on median line of head and extends to and around in front of eye, where it terminates; a blue line extends from middle of interorbital to tip of snout; the head is smoke gray, becoming blackish above eye and slightly tinted with yellowish posteriorly, the lips bright yellow, the posterior margin of opercle, preopercle, and preopercular spine blue; the breast pale smoke gray; the posterior part of dorsal brilliant indulin blue, sprinkled with pale blue dots and dashes; the dorsal has a pale blue margin, more deeply colored posteriorly; within this is a black stripe, followed by a yellow stripe; the anal rufous with curved longitudinal bands of pale blue edged with darker blue lines, the margin blue; the posterior margin of caudal orange, the ventral lemon yellow, the pectoral martius yellow.

This brilliant and exceedingly gaudy fish seems to be rare in Philippine waters.

The Museum of the Ateneo de Manila contains a specimen from Baganga, Mindanao.

This well-marked fish has been reported from Manila by Jordan and Seale; it ranges from the Red Sea and Zanzibar to Polynesia and is very common about the coral reefs of Samoa.

HOLACANTHUS TIBICEN (Cuvier and Valenciennes). Plate 20, fig. 1.

Holacanthus tibicen CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 130; GÜNTHER, Cat. Fishes 2 (1860) 46; BLEEKER, Atlas Ichthy. 9 (1878) 62, pl. 370, fig. 4; WEBER, Fische Siboga Exp. (1913) 312.

Holacanthus leucopleura BLEEKER, Nat. Tijd. Ned. Ind. 5 (1853) 79.
Centropyge tibicen KAUP, Wiegmann's Archiv Naturg. 26¹ (1860) 138.

Dorsal XIV, 16; anal III, 17; there are 35 scales in a lateral series, 8 between the lateral line and the origin of dorsal, and 20 between the lateral line and anal.

The depth of the slightly elongate, oblong-ovate body contained 1.8 to 2 times in length; the anterior dorsal profile from below nostrils to origin of dorsal fin steep and a little arched and with the ventral outline from lower jaw to caudal peduncle evenly curved; the head as long as deep, 3.1 to 3.4 times in length of body; the depth of caudal peduncle nearly twice its length, 6.4 to 6.6 times in length of body; the interorbital space strongly convex, 3.1 to 3.5 in length of head; the maxillary slightly shorter than an eye diameter and 3.5 to 3.9 in head; the circular eye rather small, 3.1 to 3.8 times in head; the bluntly rounded snout moderately long, 2.3 to 3.4 times in length of head; the mouth small and horizontal, with the jaws even; the upper portion of maxillary slips into a groove under front part of interorbital, which is nearly as wide as eye at its widest portion and serrated at its lower edge; two nostrils of about the same size very near each other in front of eyes, the front one in a tube which is much produced behind, and the posterior one a simple rounded opening; the preopercle has at its angle a long, stout, slightly curved spine, which reaches to base of pectoral fin; above this spine is strongly serrated and in front of it are one or more small, sharp spines; there are small, sharp teeth also on the outer margins of interopercle and subopercle; the opercle unarmed.

The scales moderately large, in regular transverse and longitudinal series on body; accessory scales absent; the dorsal, anal, and caudal densely scaled; the lateral line well marked, extending along back near base of dorsal and disappearing near end of dorsal fin; the dorsal spines gradually longer to the last, which is 2.2 to 2.8 times in depth of body; the rayed dorsal ra-

ther angular, the soft anal and caudal obtusely rounded; the pectoral fin is longest and rounded above, extends to a little behind anus, and is a little shorter than the ventral, the tip of which is at base of anal spines.

In alcohol the ground color is blackish violet, with a large, vertically oblong, pearl white spot between lateral line and posterior half of pectoral; the anal fin has a rather wide yellowish border anteriorly, its remaining portion and all the other fins blackish violet.

The foregoing account is based upon four examples, 62 to 102 millimeters long, from Tubigan, Jolo, and Sibutu and Sitankai Islands, Sulu Archipelago. This is the first record of the species from the Philippines.

Elsewhere it is known only from the seas of Celebes and the Moluccas. The senior author found it to be common in shallow water on coral reefs in the Tawitawi and Sibutu Island group.

The type specimen, originally preserved in the Leyden Museum but no longer in existence, was from an unknown locality and had the anal formula IV-16. Bleeker found individuals with 13 and 15 dorsal spines, and the presence of 4 anal spines is likewise merely an individual variation. The nacreous lateral spot is also subject to great variation.

HOLACANTHUS BICOLOR (Bloch).

Chætodon bicolor BLOCH, *Ichtyologie* 6 (1788) 70, pl. 206, fig. 1 (figure only).

Holacanthus bicolor CUVIER and VALENCIENNES, *Hist. Nat. Poiss.* 7 (1831) 126; GÜNTHER, *Cat. Fishes* 2 (1860) 50; *Fische der Südsee* 1 (1873) 51, pl. 39, fig. B; BLEEKER, *Atlas Ichth.* 9 (1878) 61, pl. 369, fig. 3; JORDAN and SEALE, *Bull. Bur. Fisheries* 25 (1905) (1906) 348; *Bull. Bur. Fisheries* 26 (1907) 34; JORDAN and RICHARDSON, *Bull. Bur. Fisheries* 27 (1907) (1908) 269.

Dorsal XV, 16 or 17; anal III, 18 or 19; there are 48 or 50 scales in the lateral line, about 24 between the ventral spine and the first dorsal spine.

The depth of the ovate oblong body 2.5 to 2.75 times, the obtuse head 4 to 5 times in length, including caudal fin; the diameter of eye 3 to $3\frac{1}{2}$ times in head; the interorbital space three-fourths of or equal to eye; the preorbital bone conspicuously denticulate; the preopercle conspicuously serrate on its posterior margin, the spine at its angle reaching to base of pectoral but less than twice eye; the interopercle conspicuously serrate with subspinous teeth; the scales on trunk more or

less irregularly arranged, many with secondary scales on base; the scales on head very small; the spinous dorsal a little more than twice as long as soft dorsal, the spines increasing in length posteriorly, the last shorter than head without snout; the soft dorsal much higher than spinous dorsal or than its own length, the central rays longest and produced into an acute point; the pectoral acute or acutely rounded, equal to or scarcely shorter than head; the third anal spine shorter than head without snout, the rays elongate, of the same shape and approximate length as soft dorsal; the convex caudal equal to or scarcely shorter than head; the first ventral ray more or less elongate, a little shorter than or equal to head.

The color of anterior part of body and fins to a vertical from sixth or seventh dorsal spine a beautiful orange or lemon yellow; the posterior part to a little before base of caudal, anal, and rest of dorsal violet-black, blue-black, or deep black; the remainder of caudal peduncle and caudal fin like anterior part of body; a broad black or blue-black supraocular band shaped like a horse's hoof descends on each side to eye; sometimes the cheeks are dusky or brown; the scales on the black portion of body may have transverse pearly or blue stripes; the dorsal fin partly punctate with black, the anal with spots and short irregular stripes of blue.

The above description is compiled, as we have no specimens. For more than half an hour the senior author watched some specimens of this species, one of them at least 300 millimeters long, as they swam about the dock at Bato Bato, Tawitawi Island. The species has been recorded from Manila by Jordan and Seale, and was collected at Cagayancillo by McGregor.

This species occurs from Sumatra to New Guinea and the Solomon Islands, and in the South Pacific at Samoa. A Hawaiian record is dubious. Bloch's plate shows the species, but his description is confused with that of the very similar West Indian species, *H. tricolor*.

HOLACANTHUS VROLIKI Bleeker. Plate 22, fig. 1.

Holacanthus vroliki BLEEKER, Nat. Tijds. Ned. Ind. 5 (1853) 339; GÜNTHER, Cat. Fishes 2 (1860) 51; KLUNZINGER, Syn. Fische des Rothen Meeres, Verh. Zool. Bot. Ges. Wien 20 (1870) 787; BLEEKER, Atlas Ichth. 9 (1878) 63, pl. 371, fig. 1.

Dorsal XIV, 15 to 17; anal III, 15 to 17; there are 36 to 38 scales in a lateral series, 7 between the lateral line and the origin of dorsal and 20 to 23 between the lateral line and the origin of anal.

The compressed, oblong-ovate body contained 1.7 to 2 times in length, with the profiles about equally elevated; the head a little shorter than deep, its length 3.2 to 3.4 times in length of body or 1.7 to 2 times in its depth; the depth of caudal peduncle about twice its length, and 6.5 to 7.1 times in length of body or 2 to 2.2 times in length of head; the interorbital space evenly and strongly convex, its width from 3.1 to 3.6 times in head; the eye circular, moderate in size, 2.6 to 3.5 times in length of head; the fairly short, bluntly rounded snout 1.1 to 1.3 times maxillary, which is contained from 3.1 to 3.7 times in head; the mouth small and almost horizontal, with both jaws nearly even; the preorbital, which is nearly equal to eye at its widest portion, almost wholly covers maxillary in front, its inferior margin strongly serrated; there are two rounded nostrils of about equal size in front of eye, the anterior one with a marginal flap which is very much extended behind and the other with a very low flap on its hind margin only; the preopercle is strongly serrated behind and has at its angle a long, stout, slightly pointed spine which is longer than snout and extends to base of pectoral; at the base of this spine is a strong sharp spine; the interopercle armed with two or more small, sharp spines behind; the subopercle strongly toothed below, the opercle entire.

The scales large and regular, those on fins very small and dense; the conspicuous lateral line terminates at base of caudal fin; the dorsal spines rather high and slender, those along the middle about as long as the posterior ones; both the rayed dorsal and anal rounded posteriorly; the caudal strongly and evenly convex; the pectoral fin is produced and slightly rounded superiorly, and extends to a little behind anus; the pointed ventral terminates at origin of anal fin.

The head and the anterior two-thirds of body grayish brown, this color gradually passing into violet-black on posterior third and on caudal and soft vertical fins; a transverse whitish streak on each scale, and a large black blotch on hind margin of opercle; the pectoral, ventral, and spinous dorsal fins grayish brown; the posterior margin of caudal narrowly edged with white.

Nine specimens in the Bureau of Science collection form the basis of the above description. They range in length from 45 to 75 millimeters, and were taken at Calapan, Mindoro; Cagayan de Misamis, Mindanao; and Tambagaan and Bungau

Islands, Sulu Archipelago. Two of them, 62 and 75 millimeters long, collected in January, 1923, are ripe females.

This species, which has not been reported previously from the Philippines, ranges from the Red Sea to the Moluccas. It resembles closely the *Holacanthus nox* of Bleeker in general coloration and form, but is distinct in the details of color markings, and in the presence of rounded vertical fins, relatively higher dorsal and anal spines, and a smaller number of spines on the dorsal fin.

HOLACANTHUS TRIMACULATUS Lacépède. Plate 21, fig. 1.

Holacanthus trimaculatus Lacépède apud CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 147, pl. 182; GÜNTHER, Cat. Fishes 2 (1860) 50; PLAYFAIR and GÜNTHER, Fishes of Zanzibar (1866) 38; BLEEKER, Atlas Ichthy. 9 (1878) 63, pl. 373, fig. 5.

Dorsal XIII or XIV, 18; anal III, 18; there are 45 scales in a lateral series, 10 between the lateral line and the origin of dorsal, and 27 or 28 between the lateral line and the origin of anal.

The greatest depth of the ovate, compressed body 1.7 to 1.8 times in length; the head slightly shorter than its depth and contained from 3.3 to 3.6 times in length of body, its upper profile steep and nearly straight; the caudal peduncle rather short and much compressed, deeper than long, its depth 6.8 to 7.2 times in length of body or about twice in head; the wide, moderately arched interorbital is 3.2 to 3.4 in length of head and bulges a little on upper profile of head, forming a slight depression in front and above eyes; eye almost circular, fairly large, its diameter from 3.7 to 4.1 times in head and equal to or slightly shorter than length of maxillary, which is contained 3.7 to 3.9 times in head; the snout bluntly rounded at tip, moderately long, 2.4 to 2.7 times in head; the mouth small, its gape almost horizontal; jaws equal, the upper one slipping behind into a groove under preorbital; the nostrils small and placed together in front of orbit, the anterior one in a tube which is prolonged into a small triangular flap, and the posterior one with a flap all around except at its hind portion; the preorbital has a few small but strong teeth in front of eye at its widest portion, and below this it is almost as wide as diameter of eye; the posterior and inferior edges of preopercle weakly denticulated, and at its angle there is a long, stout, slightly curved spine which equals head without snout; the denticulations of both interopercle and subopercle hardly conspicuous; the opercle entire.

The sides of body covered with large scales, those above the lateral line and on sides of abdomen smaller; accessory scales present, especially forward and above; the scales on head and fins very small to minute; the lateral line is conspicuous and terminates a little below axil of dorsal; the dorsal spines increase in length to the last, which is contained from 1.4 to 1.6 times in length of head and is slightly shorter than second anal spine; the soft dorsal rounded posteriorly, the seventh and eighth rays longest; the anal slightly pointed behind, its ninth and tenth rays longest, the anal extending a little farther posteriorly than soft dorsal; the pectoral and ventral fins about equal in length, the former ending before anus while the latter just extends to it; the caudal fin convex and about as long as pectoral.

In life the ground color is brilliant brownish orange, fading into lemon yellow on breast and belly, and into bluish white near base of anal fin; a dark blue ocellated spot on each side of nape, and a larger one on each shoulder, the spots ringed with pale yellow, the lips and the large preopercular spine dark blue; the dorsal, caudal, and ventral colored similarly to body; the pectoral lemon yellow on its outward portion and brownish yellow toward base; the anal spines and outward half of anal bluish black, the rest of the fin bluish white.

In alcohol the color has turned darker, leaving a whitish or yellowish center on each scale; the lips, and the spots on nape and shoulder have become blackish, the yellow ring about each fading to whitish; the white color on lower portion of body near base of anal fin and on upper half of anal rays has disappeared; the lower half of anal black, the other fins colored similarly to body.

Here described from three specimens, 132.5 to 157.5 millimeters long, collected at Maricaban Island, Batangas; Sayan Island, Samar; and Jolo, Sulu Province. The smallest specimen is a ripe female, collected at Sayan Island in February, 1925.

The name *trimaculatus* is a misnomer for this fish, in as much as there are four ocellated spots present instead of three as given by Cuvier and Valenciennes. The species is rare and has been reported from Zanzibar and the Moluccas.

HOLACANTHUS XANTHOMETOPON Bleeker.

Holacanthus xanthometopon BLEEKER, Nat. Tijd. Ned. Ind. 4 (1853) 258; Atlas Ichth. 9 (1878) 64, pl. 371, fig. 2; GÜNTHER, Cat. Fishes 2 (1860) 51; DAY, Fishes of India (1878) 114.

Dorsal XIV, 17; anal III, 17; 47 scales in lateral series, 7 between the lateral line and the origin of dorsal, and 25 between the lateral line and anal.

The depth of the thick, laterally compressed, oblong body about 1.9 times in length; the anterior profile descends very steeply from origin of dorsal to base of upper lip, the short upper lip projecting strongly in a short abrupt curve so that the fish has a marked snub nose; the blunt head 4 times in length; eye 4.4 times in head, 1.6 times in the broad convex interorbital, and 1.9 times in the short blunt snout, which is 2.3 times in head; the strong preopercular spine 1.77 times eye and 2.5 times in head; posterior margin of the steeply inclined preopercle finely serrate; about 43 rows of scales from angle of gill opening to base of caudal; about 30 scales in transverse series from first dorsal to ventral spine and 7 between lateral line and first dorsal spine; the soft dorsal and anal fins obtusely rounded; depth of caudal peduncle 1.93 times in head, 7.83 times in length; the convex caudal 1.25 times in head; the broad pectoral 0.88 of head; the ventral narrow, pointed, very elongate, extending to base of anal, 2.4 times in length.

In alcohol each scale has a blue or violet-black spot, edged with bright yellow, the spots very small on breast and the yellow very prominent; a wide yellow band between and including eyes; rest of head blue-black, with numerous small yellow spots on sides; a small yellow spot behind angle of gill opening; dorsal, caudal, and pectoral clear bright yellow, with a large blue-black spot on posterior dorsal rays; ventral very dark blue or violet, merging into yellow on posterior rays, the rays thickly sprinkled with small circular blue dots; the soft dorsal, anal, and caudal each edged with a black line; a blue-black margin on upper side of pectoral; ventrals very deep blue.

This very beautiful fish is here described from a specimen, 242 millimeters long, collected on a reef at Quiminatin Island, one of the Cuyo Islands. The senior author saw a much larger specimen in Cebu, but the fisherman refused to sell, saying he wanted to eat it.

The color of living or fresh specimens similar to that given, but the blue or violet and yellow much brighter.

This angel fish has been recorded from Sumatra, Goram, Waigiou, and the Andaman Islands.

HOLACANTHUS IMPERATOR (Bloch). Plate 23, fig. 2.

Chætodon imperator BLOCH, Ichtyologie 6 (1788) 38, pl. 194.

Holacanthus imperator CUVIER and VALENCIENNES, Hist. Nat. Poiss.

7 (1831) 135; GÜNTHER, Cat. Fishes 2 (1860) 52; PLAYFAIR and

GÜNTHER, Fishes of Zanzibar (1866) 38; KLUNZINGER, Fische

des Rothen Meeres 1, Verh. Zool. Bot. Ges. Wien 20 (1870) 787;

GÜNTHER, Fische der Südsee 1 (1873) 53, pl. 41, fig. A; DAY,

Fishes of India (1878) 112, pl. 28, fig. 5.

Acanthochaetodon imperator BLEEKER, Atlas Ichth. 9 (1878) 70, pl.

367, fig. 2; pl. 374, fig. 4.

Dorsal XIV, 20 to 22; anal III, 19 to 21; there are 88 to 93 scales in a lateral series, 15 or 16 between the lateral line and the origin of dorsal, and about 36 between the lateral line and the origin of anal.

The depth of the ovoid, markedly thick body from 1.6 to 1.9 times in length; the head from 3.4 to 3.8 times or nearly as long as deep, its dorsal outline slightly and unevenly concave; the caudal peduncle much deeper than long, its depth 7 to 8.5 in length of body; the interorbital space strongly arched, narrowest in front of eyes, 3 to 3.4 times in length of head; the eye almost circular and contained 1.7 to 2 times in the length of the bluntly rounded snout, which is 2.2 to 2.3 times in head; the maxillary longer than diameter of eye and from 3.2 to 3.4 in length of head; the mouth small and oblique, with the jaws even and the premaxillary slipping into a groove under the front edge of the finely serrated preorbital; two simple rounded nostrils of nearly equal size close together in front of each eye, the more anterior having a marginal flap above; the preopercle armed at its angle with a long, stout, slightly curved spine which reaches to base of middle pectoral rays, and is serrated above and in front of this spine; the suboperculum weakly denticulated; both opercle and interopercle unarmed.

The scales very small, those on head numerous and very small to minute; accessory scales pretty evenly distributed all over body; the lateral line plainly visible on tail, and rather inconspicuous on rest of body; the dorsal spines gradually become longer posteriorly, the last one being as long as head from anterior edge of preorbital to hind extremity of opercle; the soft dorsal produced posteriorly into a filament, which extends beyond tip of caudal fin; the anal fin broadly rounded, the caudal fin markedly convex; the tip of the short and somewhat rounded pectoral does not reach to anal opening; the

outer ray of ventral is filamentous and ends posteriorly beyond anus, the ventral spine a little more than half the length of head.

In alcohol the ground color varies from violet-brown to violet-black, becoming much darker ventrally and on outward portion of anal, with more brown on breast and belly, and more black on anal fin; the body has many yellowish, longitudinal, slightly waved stripes; a curved black band, convex behind and edged with bluish white, runs across interorbital through eyes and tapers to a point at base of preopercular spines; a large oblong black spot, edged anteriorly with bluish white and posteriorly with yellowish, lies between shoulder, opercle, and root of pectoral; the dorsal and anal fins narrowly edged with bluish white, the former yellowish on its outward portion; the caudal entirely yellowish; the pectoral violet-black toward base and yellowish behind; the ventral brownish, with an indication of the presence of longitudinal bluish white stripes on its membranes; the lips bluish white.

The six examples above described vary from 102.5 to 280 millimeters in length, and were taken at Calapan and Puerto Galera, Mindoro, the southern coast of Batangas Province, and Basbas Island, Sulu Archipelago. Three specimens were collected at Puerto Galera, some time between March and May, 1912; one of them, 223 millimeters long, is a female about ready to spawn. There is no previous record of this species from the Philippines.

This beautifully and distinctly marked fish was named "The Emperor of Japan" by the early Dutch explorers and naturalists in the East Indies. According to them it was the most highly esteemed fish in the Moluccas, its flesh comparable with that of the salmon, and commanded a very high price. This very showy holacanthid occurs from the Red Sea and Zanzibar to the Society Islands in the South Pacific, but does not seem to be abundant anywhere.

HOLACANTHUS NICOBARIENSIS (Bloch and Schneider).

Chætodon nicobariensis BLOCH and SCHNEIDER, Syst. Ichth. (1801) 219, pl. 50.

Holacanthus nicobariensis GÜNTHER, Cat. Fishes 2 (1860) 52; Fische der Südsee 1 (1873) 54; DAY, Fishes of India (1878) 112, pl. 28, fig. 6; VAILLANT, Nouv. Arch. Mus. Paris III 5 (1893) 58.

Acanthochætodon nicobariensis BLEEKER, Atlas Ichth. 9 (1878) 69, pl. 365, fig. 1.

Dorsal XIII or XIV, 19 to 21; anal III, 19 or 20; there are 85 to 88 scales in a lateral series, 13 or 14 between the lateral

line and the origin of dorsal, and 36 to 40 between the lateral line and anal.

The depth of the oval, much compressed body 1.8 times in length, its anterior dorsal profile evenly arched; the head 2.8 to 3.1 times in length of body; the depth of the strongly compressed and short caudal peduncle 8.3 to 8.4 times or 2.7 to 2.9 times in length of head; the slightly and evenly arched interorbital contained from 3.5 to 3.9 times in head; the circular, moderately large eye 2.7 to 3.2 times; the rounded, short snout 3.1 to 3.2 times and equal to or slightly longer than maxillary which is contained from 3.2 to 3.3 times in head; the mouth small and slightly oblique, with the lower jaw a trifle in advance of the upper which is partly covered behind by the denticulated portion of preorbital; the nostrils small and close together in front of eyes, the anterior rounded one with a marginal flap which is much wider behind, and the posterior ovate one a simple opening; the preopercle has at its vertical limb very fine serrations, below which is the long, stout, slightly curved spine which is shorter than an eye diameter; the interopercle armed inferiorly with small sharp teeth; the edges of both opercle and subopercle smooth.

The scales of body rather small and regular in form, those covering head and fins very small to minute; accessory scales absent; the dorsal spines evenly graduated to the last, which is the highest and about equal to half the depth of body; the caudal and soft vertical fins are rounded, the pectoral extends to anus and the outer ray of vertical is produced into a filament which ends posteriorly at base of anal spines.

In alcohol the ground color is violet-black, with curved, alternately broad and narrow white lines, the posterior of which forms a complete ring; on dorsal, anal, and caudal fins the lines are more or less divided and reticulated; on each side of head are three wide vertical white lines, one touching hind margin of orbit, the second descending from suborbital to interopercle, and the third crossing angle of mouth and uniting with the opposite line on the other side at tip of snout; a broad horizontal white line crosses interorbital from eye to eye; there is no longitudinal white line running along middle of forehead; the posterior half of caudal white.

The above description is from two examples, 29 and 67 millimeters long, from Guam.

The senior author for some time had a living specimen from Calapan, Mindoro, but it was not preserved when it died, so that

our collection contains no Philippine specimen at present. Elsewhere it ranges from the East Indies to the Ladrone and Society Islands.

This fish is easily distinguished from *Holacanthus semicirculatus* by the more-curved lines on posterior part of body, by the short transverse line passing from eye to eye, and by the higher scale count.

HOLACANTHUS SEMICIRCULATUS Cuvier and Valenciennes. Plate 19, fig. 1.

Holacanthus semicirculatus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 143, pl. 183; LESSON, Voy. Coquille, Zool., Poiss. 2 (1830) 173, pl. 30, fig. 3; GÜNTHER, Cat. Fishes 2 (1860) 53; WEBER, Fische Siboga Exp. (1913) 311.

Holacanthus striatus RÜPPELL, Neue Wirbelt. Fische (1838) 32, pl. 10, fig. 2; GÜNTHER, Cat. Fishes 2 (1860) 53.

Acanthochætodon semicirculatus BLEEKER, Atlas Ichthy. 9 (1878) 69, pl. 370, fig. 5.

Dorsal XIII, 22; anal III, 20; there are 75 scales in a lateral series, 14 between the lateral line and the origin of dorsal, and 45 between the lateral line and the origin of anal.

The body ovoid, deep, much compressed, its depth contained 1.7 times in length, the anterior dorsal profile a low, even curve from below nostrils to origin of dorsal; the head a little shorter than deep, 3.2 times in length of body; the depth of the short, strongly compressed caudal peduncle 7.1 times in length of body. The large, circular eye contained 2.8 times in length of head and placed high up near dorsal profile of head, leaving an almost flat, rather narrow interorbital space which is 3.8 times in head; the blunt snout slightly longer than eye diameter, 2.6 in length of head; the maxillary rather short and contained 3.3 times in head; mouth small, slightly oblique, with the lower jaw a little in advance of the upper and with the maxillary partly slipping into a groove under the widest portion of preorbital, which is finely serrated in front and more than half the diameter of orbit; the nostrils small and close together, the first one provided with a narrow marginal flap in front and with a much wider one behind; the preopercle is finely and evenly denticulated behind, and has at its angle a short, curved and slightly pointed spine reaching to gill opening; in front of this spine along inferior edge of interopercle are several small sharp teeth; both opercle and subopercle entire.

The scales generally small, those on head and fins very small to minute; accessory scales absent; the dorsal spines are rather slender and increase in height posteriorly, the last one slightly higher than third anal spine; both the rayed dorsal

and anal broadly rounded; the caudal fin strongly convex; the pectoral ends behind above anus while the ventral extends to base of anterior anal rays, its outer ray filamentous and its spine contained 3 times in depth of body.

In alcohol the ground color is blackish brown, with five wide, curved, transverse white bands, alternating with narrow bluish ones; the first wide one immediately behind eye, the second between middle dorsal spines and anus, the third and fourth between the soft vertical fins, and the fifth in front of caudal peduncle; a median white line extends longitudinally from nape to tip of snout; a white line across anterior portion of each eye, and another across angle of mouth; the caudal fin blackish brown, whitish posteriorly, with white cross streaks.

Here described from a single specimen, 57 millimeters long, from Palawan, the first recorded from the Philippines. In this species the transverse lines on body are more crescent-shaped and the scales fewer than in *Holacanthus nicobariensis*.

Elsewhere this handsome fish occurs throughout the East Indies and southeastward in Melanesia to the Bismarck Archipelago.

HOLACANTHUS MESOLEUCUS (Bloch). Plate 7, fig. 1.

Chætodon mesoleucus BLOCH, Ichtyologie 6 (1788) 88, pl. 216, fig. 2.

Holacanthus mesoleucus LACÉPÈDE, Hist. Nat. Poiss. 4 (1803) 528, 537; CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 127; GÜNTHER, Cat. Fishes 2 (1860) 54.

Chætodon mesomelas GMELIN, Syst. Nat. ed. 13 (1788) 1263.

Chætodontoplus mesoleucus BLEEKER, Atlas Ichth. 9 (1878) pl. 369, fig. 5.

Dorsal XII (rarely XI), 16 to 18; anal III, 16 to 18; there are 85 to 92 scales in a lateral series, 15 to 17 between the lateral line and the origin of dorsal, and 37 to 41 between the lateral line and the origin of anal.

The body oval and compressed, its depth contained from 1.6 to 1.9 times in length, the ventral outline an even curve from lower jaw to base of caudal peduncle; the head as long as deep, 3.1 to 3.5 times in length of body, its dorsal profile almost straight to hind edge of upper jaw; the depth of caudal peduncle 6.5 to 7.1 times in length of body and a little less than twice its own length; the interorbital space strongly arched and contained from 3.1 to 3.6 times in length of head; the circular eye contained 2.6 to 3.5 times in head; the maxillary from 3.4 to 3.6 times in head, and shorter than the bluntly rounded snout which is contained from 2.5 to 3.5 times; the mouth small, nearly

horizontal, with the lower jaw slightly in advance of the upper; the preorbital coarsely denticulated in front of its lower edge, its greatest width a little over two-thirds eye; the preopercle armed at its angle with a long, stout, and slightly curved spine, which reaches almost to base of pectoral; above and in front of this spine the preopercle is strongly denticulated; both subopercle and interopercle have several more or less hidden teeth, the opercle unarmed.

The scales on trunk generally small and in irregular series, those on head very small to minute; accessory scales present on anterior portion of body; the lateral line is conspicuous, running close to upper end of dorsal fin and top of tail, and terminates at base of caudal; a second, short, straight lateral line extends along middle on each side of caudal peduncle, ending anteriorly between posterior third of dorsal and anal rays; the fourth, fifth, and sixth dorsal spines are the highest; both the soft dorsal and anal subequal and very broadly rounded; the caudal broadly and evenly convex; the obtusely rounded pectoral does not quite extend to anus, while the strongly pointed ventral just touches it.

The color in life clear lemon yellow on head and abdomen, shading into deep violet-brown or blackish on rest of body; the sides marked with very many irregular, wavy, often broken, longitudinal clear blue lines; a broad, dark, violet-brown, ocular band descends from nape to breast where it meets its fellow; the lips deep violet-brown; the dark color and blue markings of side extend over dorsal and anal, except that the first dorsal spine or two are yellow; the pectorals, ventrals, and caudal clear lemon yellow, the color of the last named very sharply marked from that of body; the soft dorsal and anal each margined posteriorly with a blue line; the caudal narrowly margined posteriorly with whitish.

In alcohol the blue markings change to white or very pale and the yellow becomes white or nearly so; the violet is lost in the dark part of body, the color becoming more or less black or velvety blackish.

Here described from twelve specimens ranging in length from 81 to 125 millimeters, from the following localities:

Puerto Galera, Mindoro, 1.	Estancia, Panay, 1.
Masbate, 2.	Zamboanga, Mindanao, 1.
Gigantangan Island, Leyte	Bato Bato, Tawitawi Island, 2.
Province, 2.	Jolo, 3.

Our smallest example, collected in July, 1922, is a female about ready to spawn.

This beautiful little holacanthid, notable for the richness and delicacy of its quiet colors, is found only in the East Indies, from Singapore to the Moluccas, and is here reported for the first time from the Philippines. It is readily recognizable by its characteristic color markings, especially the wide, velvety, violet-brown ocular band, by the presence of 12 (rarely 11) dorsal spines, and by the scale counts.

HOLACANTHUS LEPIDOLEPIS Bleeker. Plate 23, fig. 1.

Holacanthus lepidolepis BLEEKER, Nat. Tijds. Ned. Ind. 4 (1853) 468; GÜNTHER, Cat. Fishes 2 (1860) 47; BLEEKER, Atlas Ichthy. 9 (1878) 67, pl. 372, fig. 1.

Holacanthus ignatius PLAYFAIR, Proc. Zool. Soc. London (1867) 852, pl. 41.

Dorsal XIV, 21; anal III, 20; there are 80 scales in a lateral series, 15 between the lateral line and the origin of dorsal, and 40 between the lateral line and the origin of anal.

The body ovoid, deep, compressed, the upper profile of head almost straight to below nostrils; the depth of body contained 1.7 times in length; the head a little shorter than deep, 2.6 in length of trunk; the caudal peduncle very deep and much compressed, its depth more than twice its length or greater than half the length of head; the evenly convex, rather wide interorbital is contained 3.3 times in length of head and equals length of maxillary; the circular eye is 4.7 times in head and 2.2 times in the bluntly rounded snout, which is contained 2.1 times in head; the gape of the small mouth almost horizontal, the jaws equal; the upper one slips partly under preorbital, which has in front at its widest portion a few small strong teeth; the nostrils close together on the depressed portion of snout in front of eye, the first one almost a vertical slit, more than a third of eye diameter, placed about halfway between anterior margin of orbit and upper tip of premaxillary, and provided with a flap behind; the other nostril nearly circular, simple, placed above and behind first nostril; the preopercle is finely serrated behind and coarsely serrated below, and has at its angle a long, stout, slightly curved spine, which is about as long as snout.

The head and fins covered densely with small to minute scales; accessory scales present all over body; the lateral line is conspicuous and extends behind to base of caudal fin; the dorsal spines evenly graduated to the last, which is the longest and nearly equals length of snout and eye together; the anterior dorsal and anal rays produced into filaments, which extend be-

yond the posterior margin of the strongly convex caudal; the pectoral longest superiorly, slightly pointed, nearly equal to length of head, its posterior end a little before anus; the ventral fin is longer than the pectoral and extends to origin of anal, its outer ray filamentous, its spine 1.6 in head or twice the length of maxillary.

In alcohol the ground color is olive brown, darker anteriorly and posteriorly; the scales of sides have each a blackish spot, dark blue in life, forming diagonal rows; the soft dorsal, anal, caudal peduncle, and caudal thickly sprinkled with small pearly white or pearl blue spots which extend forward upon posterior third of trunk; the dorsal and anal narrowly margined with bluish white, their produced portions yellowish; the caudal fin tipped with bluish white; there are longitudinal bluish lines on the membranes of ventral.

Here described from an example, 290 millimeters long, taken at Ambil Island, Mindoro. This is the first Philippine record of the species, which is known elsewhere only from the sea of Batavia.

The senior author saw a very large specimen of this species off the wharf at Bato Bato, Tawitawi Island. It was 400 millimeters or more in length.

PLATACIDÆ

The rhomboid body much compressed laterally and greatly elevated, with a very short, blunt snout, the depth nearly equal to the length, or much more than the length in the young; the head much deeper than long, with very steep profile. One dorsal, with 3 to 7 spines more or less hidden, anal spines 3; ventrals long to very long. Scales ctenoid, moderate to small, extending upon dorsal, anal, and caudal. Mouth small, teeth setiform, trilobed; vomerine teeth present in some species; air bladder simple; branchiostegals 6.

But one genus known, occurring in the Indian Ocean and the East Indies, north to Southern Japan.

Genus PLATAX Cuvier

Platax CUVIER, Règne Anim. 2 (1817) 334.

The generic characters are included above. Of the many species named by authors perhaps four are valid, of which but one has thus far been taken in the Philippines.

PLATAX ORBICULARIS (Forskål). Plate 24.

Chætodon orbicularis FORSKÅL, Descrip. Anim. (1775) 59.

Platax orbicularis CUVIER and VALENCIENNES, Hist. Nat. Poiss. 7 (1831) 174; RÜPPELL, Atlas Fische des Rothen Meeres (1828) 67, pl. 18, fig. 3; GÜNTHER, Cat. Fishes 2 (1860) 490; Fische der Südsee 1 (1873) 140; SEALE and BEAN, Proc. U. S. Nat. Mus. 33 (1905) 246; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 335; Bull. Bur. Fisheries 26 (1907) 32; EVERMANN and SEALE, Bull. Bur. Fisheries 26 (1907) 97; JORDAN and RICHARDSON, Bull. Bur. Fisheries 27 (1907) (1908) 268.

Chætodon vespertilio BLOCH, Ichtyologie 6 (1788) 49, pl. 199, fig. 2 (very poor figure); BENNETT, Fishes of Ceylon (1834) 5, pl. 5 (fine figure).

Platax vespertilio CUVIER, Règne Anim. ed. 1 2 (1817) 334; GÜNTHER, Cat. Fishes 2 (1860) 489; DAY, Fishes of India (1878) 236, pl. 51A, fig. 5; BLEEKER, Atlas Ichth. 9 (1878) 74, pl. 379, fig. 1, and pl. 380, figs. 2 and 3; MEYER, Ann., Soc. España Hist. Nat. 14 (1885) 25.

Platax vespertilio japonicus SCHLEGEL, Pisces, Fauna Japonica, pl. 43.

Chætodon teira FORSKÅL, Descrip. Anim. (1775) 60; BLOCH, Ichtyologie 6 (1788) 47, pl. 199, fig. 1 (fine figure).

Platax teira CUVIER, Règne Anim. ed. 1 2 (1817) 334; GÜNTHER, Cat. Fishes 2 (1860) 492; Fische der Südsee 1 (1873) 141; DAY, Fishes of India (1878) 235, pl. 51B, fig. 4; BLEEKER, Atlas Ichth. 9 (1878) 73, pl. 379, fig. 2, and pl. 382, fig. 1; JORDAN and FOWLER, Proc. U. S. Nat. Mus. 25 (1902) 526; JORDAN and SEALE, Bull. Bur. Fisheries 25 (1905) (1906) 335; FOWLER and BEAN, Proc. U. S. Nat. Mus. 62 (1922) 55.

Common names.—English, leaf fish, bat fish; Tagalog, *dahon gabi*; Leyte-Visayan, *dayapugan*; Ilongo-Visayan, *talocogan*.

We include here all the synonymy of the numerous nominal species listed by Bleeker under both *Platax teira* and *Platax vespertilio*. Some of these were founded on young specimens, others on individual variations.

Dorsal V, 32 to 39; anal III, 23 to 28; there are 47 to 68 scales in a horizontal series from the angle of the gill opening to the base of caudal, 22 to 35 between the lateral line and the origin of dorsal, and 39 to 57 between the lateral line and the origin of anal.

The body very deep and much compressed, very strongly arched above and below, the dorsal profile more convex than the ventral and markedly obtuse from snout to origin of dorsal fin; in the adult the greatest depth of body nearly equal to its length, and in very young examples much greater; the head much deeper than long, its upper profile much more elevated and very steep, its length 2.8 to 3.2 times in length of body; the depth of the short, strongly compressed caudal peduncle con-

tained from 6.1 to 7.1 times in length of body; the interorbital space very broad and very strongly convex, its width 2.1 to 3 times in head and greater than length of maxillary, which is contained from 2.7 to 3.6 times; the large, circular eye superior and slightly anterior, but in very large individuals about midway in length of head, its diameter 3 to 4.3 times in that of head; the bluntly rounded snout obtuse and 1.9 to 2.6 times in head, or nearly twice width of preorbital which is contained from 3.3 to 5.6 times in head; the mouth small and horizontal, the jaws even, the slender and compressed teeth setiform and trilobed at their summits, none present on vomer; the two nostrils far apart, the anterior nostril small, circular, and having a low fleshy rim, the posterior one a nearly vertical elongate opening directly in front of orbit; the orbital ring and the opercular margin entire.

The scales ctenoid and of small size, becoming numerous and very small to minute on head, vertical fins, and caudal; the lateral line is slightly arched and terminates at base of caudal fin; the dorsal spines more or less hidden and evenly graduated to the last, which is the highest and joined to the soft dorsal; the anal spines decrease also in height behind and are joined to soft anal; the dorsal and anal rays become lower posteriorly, the anterior ones becoming very much prolonged in the young and extending beyond end of caudal fin; the middle rays of caudal slightly prolonged, making the posterior end of fin concave on either half; the short, rather broad pectoral is contained from 1.1 to 1.7 times in head and does not extend beyond base of anal spines; the ventral rather long and very much produced in very young examples, sometimes reaching end of caudal fin, its spine 1.2 to 1.7 times in length of head or approximately as long as pectoral.

In life the general color is blackish brown, with a gloss of purplish; the young have three diffused blackish bands, the first one as wide as orbit and sometimes reticulated with black, running downward through eye to ventrals; the second broad band descends from dorsal spines and a few of the rays, passing behind head toward belly, where it is lost; a third, very broad band runs from posterior two-thirds of soft dorsal to the same part of soft anal; these blackish bands disappear with age; the fins black, with the exception of pectoral which is yellowish.

In adults the color between the bands may be grayish to brownish, often yellowish, with a silvery luster over all; the pectoral and ventrals yellow or golden, except basally, and the caudal sometimes yellow, except its posterior margin.

In alcohol the fish loses its purplish tint, and is dark brown or blackish brown, with the vertical bands very much diffused in the ground color.

Here described from thirty-six specimens of varying sizes in the Bureau of Science collection, the largest 275 millimeters in length. They were collected at the following places: Manila; Monja Island; Hamilo and Nasugbu, Batangas Province; San Miguel Bay and Cabusao, Camarines Sur; Calapan, Mindoro; Concepcion, Busuanga Island; Culion Island; Estancia and Dumangas, Panay; Guimaras Island; Dulag and Tacloban, Leyte; Inabanga, Bohol; Puerto Princesa, Palawan; Butuan and Agusan River, Agusan; Balabac Island; Caldera Bay, Zamboanga; and Tubigan, Jolo, Sibutu, and Sitankai Islands, Sulu Archipelago. We have examined also two examples, 72 and 76 millimeters long, from Sandakan, Borneo.

We have examined very many living, fresh, and alcoholic specimens, and the senior author has kept living adult and juvenile specimens under observation for six years. As a result of our studies we are unable to distinguish more than one species. It is a very easy matter to select a series of typical *P. orbicularis* and *P. teira* of authors, but we find every possible sort of gradation between. The large-scaled forms seem very distinct, but careful examination of many specimens shows that small accessory scales are intercalated, and as these become more numerous the smaller-scaled "species" is formed. We have found every stage showing the transition from large-scaled to small-scaled forms.

The young undergo great changes in body shape, color, and relative size and shape of the fins. Young specimens, after having been kept under continuous observation for several years, seemed literally transformed during that time. In some cases it did not seem possible that they could be our common species, but in time they altered until they were like the typical adults. We do not consider differences in the shape of the profile of any specific value.

The leaf fish does well in captivity, a considerable number having been kept in the Bureau of Science aquarium for ten years; unfortunately, during our absence from Manila in 1924 they were neglected, and all died but one, which is still alive, twelve years after having been placed in the tank. It reaches a large size, and in favorable localities, such as rocky reefs or small sheltered bays, may be quite abundant. The senior author has seen them caught in considerable numbers with hook and line,

using banana for bait and fishing at a depth of 18 to 20 meters. Some of them were about 500 millimeters in diameter, with a weight of 3 to 4 kilograms, and were entirely too large to be preserved in any available container. The flesh is of excellent quality. They are caught in bobos and by hook and line.

Under the names *Platax orbicularis*, *Platax respertilio*, *Platax teira*, and *Platax* sp. this fish has been recorded from the following Philippine localities: "Philippine Islands," by Günther; Cebu, by Meyer; Iloilo by Jordan and Seale; Ticao and Cagayancillo by Jordan and Richardson; Zamboanga by Seale and Bean and by Fowler and Bean; and from Jolo by Evermann and Seale.

The leaf fish is widely distributed, and ranges from the Red Sea and east coast of Africa to Samoa and the Society Islands, its center of distribution apparently in the East Indies; it extends northward to China, Formosa, northern Japan, and the Bonin Islands; southward it ranges to the northwestern coast of Australia.

In order to show the scale variations we append the counts made on twenty-five specimens.

Scales above lateral line to origin of dorsal.	Scales in horizontal series from angle of gill opening to caudal base.	Scales below lateral line to origin of anal.
22	50	41
23	47	46
24	50	40
24	52	47
25	48	47
25	55	46
26	47	43
26	49	41
26	50	39
26	51	46
27	47	41
28	55	45
29	50	41
29	63	53
30	52	48
30	65	54
30	67	52
31	57	50
31	60	48
33	58	55
33	60	50
33	64	57
33	63	55
34	64	55
35	62	50

RECAPITULATION

Family 1. DREPANIDÆ

Genus 1. DREPANE Cuvier and Valenciennes

1. *Drepane punctata* (Linnæus).
2. *Drepane longimana* (Bloch and Schneider).

Family 2. SCATOPHAGIDÆ

Genus 2. SCATOPHAGUS Cuvier and Valenciennes

3. *Scatophagus argus* (Boddaert).

Family 3. EPHIPPIDÆ

Genus 3. EPHIPPUS Cuvier

4. *Ephippus orbis* (Bloch).

Family 4. CHÆTODONTIDÆ

Genus 4. CHELMON Cuvier

5. *Chelmon rostratus* (Linnæus).

Genus 5. FORCIPIGER Jordan and McGregor

6. *Forcipiger longirostris* (Broussonet).

Genus 6. PARACHÆTODON Bleeker

7. *Parachætodon ocellatus* Cuvier and Valenciennes.

Genus 7. CHÆTODON Linnæus

8. *Chætodon* (*Megaprotodon*) *strigangulus* (Solander).
9. *Chætodon* (*Gonochætodon*) *triangulum* (Kuhl and Van Hasselt).
10. *Chætodon plebeius* Broussonet.
11. *Chætodon auriga* Forskål.
12. *Chætodon vagabundus* Linnæus.
13. *Chætodon argentatus* Smith and Radcliffe.
14. *Chætodon chrysurus* Desjardins.
15. *Chætodon rafflesi* Bennett.
16. *Chætodon modestus* (Schlegel).
17. *Chætodon octofasciatus* Bloch.
18. *Chætodon collare* Bloch.
19. *Chætodon ornatissimus* (Solander).
20. *Chætodon melanotus* Bloch and Schneider.
21. *Chætodon ulietensis* Cuvier and Valenciennes.
22. *Chætodon lineolatus* Quoy and Gaimard.
23. *Chætodon bella-maris* Seale.
24. *Chætodon adiergastos* Seale.
25. *Chætodon fasciatus* Forskål.
26. *Chætodon selene* Bleeker.

27. *Chætodon carens* Seale.
28. *Chætodon ephippium* Cuvier and Valenciennes.
29. *Chætodon kleini* Bloch.
30. *Chætodon punctato-fasciatus* Cuvier and Valenciennes.
31. *Chætodon unimaculatus* Bloch.
32. *Chætodon trifasciatus* Mungo Park.
33. *Chætodon bennetti* Cuvier and Valenciennes.
34. *Chætodon speculum* Kuhl and Van Hasselt.
35. *Chætodon citrinellus* Broussonet.

Genus 8. CORADION Kaup

36. *Coradion chrysozonus* (Kuhl and Van Hasselt).

Genus 9. MICROCANTHUS Swainson

37. *Microcanthus strigatus* (Cuvier and Valenciennes).

Genus 10. HEMITAUICHTHYS Bleeker

38. *Hemitaurichthys polylepis* Bleeker.

Genus 11. HENIOCHUS Cuvier

39. *Heniochus acuminatus* Linnæus.
40. *Heniochus singularius* Smith and Radcliffe.
41. *Heniochus varius* (Cuvier and Valenciennes).
42. *Heniochus permutatus* Bennett.

Genus 12. HOLACANTHUS Lacépède

43. *Holacanthus lamarcki* Lacépède.
44. *Holacanthus sexstriatus* (Kuhl and Van Hasselt).
45. *Holacanthus multifasciatus* Smith and Radcliffe.
46. *Holacanthus diacanthus* (Boddaert).
47. *Holacanthus tibicen* (Cuvier and Valenciennes).
48. *Holacanthus bicolor* (Bloch).
49. *Holacanthus vroliki* Bleeker.
50. *Holacanthus trimaculatus* Lacépède.
51. *Holacanthus xanthometopon* Bleeker.
52. *Holacanthus imperator* (Bloch).
53. *Holacanthus nicobariensis* (Bloch and Schneider).
54. *Holacanthus semicirculatus* Cuvier and Valenciennes.
55. *Holacanthus mesoleucus* (Bloch).
56. *Holacanthus lepidolepis* Bleeker.

Family 5. PLATACIDÆ

Genus 13. PLATAX Cuvier

57. *Platax orbicularis* (Forskål).

ILLUSTRATIONS

PLATE 1

- FIG. 1. *Drepane punctata* (Linnæus). (Drawing by P. Bravo.)
2. *Drepane longimana* (Bloch and Schneider). (Drawing by P. Bravo.)

PLATE 2

- FIG. 1. *Ephippus orbis* (Bloch). (Drawing by P. Bravo.)
2. *Scatophagus argus* (Boddaert). (Drawing by P. Bravo.)

PLATE 3

- FIG. 1. *Chelmon rostratus* (Linnæus). (Drawing by P. Bravo.)
2. *Forcipiger longirostris* (Broussonet). (Drawing by A. L. Canlas.)

PLATE 4

- FIG. 1. *Chætodon strigangulus* (Solander). (Drawing by P. Bravo.)
2. *Chætodon argentatus* Smith and Radcliffe. (After Smith and Radcliffe.)

PLATE 5

- FIG. 1. *Chætodon triangulum* (Kuhl and Van Hasselt). (Drawing by A. L. Canlas.)
2. *Chætodon vagabundus* Linnæus. (Drawing by A. L. Canlas.)

PLATE 6

- FIG. 1. *Chætodon plebeius* Broussonet. (Drawing by A. L. Canlas.)
2. *Chætodon rafflesi* Bennett. (Drawing by A. L. Canlas.)

PLATE 7

- FIG. 1. *Holacanthus mesoleucus* (Bloch). (Drawing by A. L. Canlas.)
2. *Chætodon auriga* Forskål. (Drawing by J. N. Nievera.)

PLATE 8

- FIG. 1. *Chætodon chrysurus* Desjardins. (Drawing by J. N. Nievera.)
2. *Chætodon bennetti* Cuvier and Valenciennes. (Drawing by A. L. Canlas.)

PLATE 9

- FIG. 1. *Chætodon ornatissimus* (Solander). (Drawing by A. L. Canlas.)
2. *Chætodon fasciatus* Forskål. (Drawing by A. L. Canlas.)

PLATE 10

- FIG. 1. *Chætodon selene* Bleeker. (Drawing by A. L. Canlas.)
2. *Chætodon lineolatus* Quoy and Gaimard. (Drawing by J. N. Nievera.)

PLATE 11

- FIG. 1. *Chætodon unimaculatus* Bloch. (Drawing by P. Bravo.)
2. *Chætodon melanotus* Bloch and Schneider. (Drawing by A. L. Canlas.)

PLATE 12

- FIG. 1. *Chætodon punctato-fasciatus* Cuvier and Valenciennes. (Drawing by M. L. Nievera.)
2. *Scatophagus argus* (Boddaert), young. (Drawing by A. L. Canlas.)

PLATE 13

- FIG. 1. *Chætodon trifasciatus* Mungo Park. (Drawing by A. L. Canlas.)
2. *Chætodon kleini* Bloch. (Drawing by A. L. Canlas.)

PLATE 14

- FIG. 1. *Chætodon citrinellus* Broussonet. (Drawing by A. L. Canlas.)
2. *Chætodon speculum* Kuhl and Van Hasselt. (Drawing by A. L. Canlas.)

PLATE 15

- FIG. 1. *Chætodon adiergastos* Seale. (After Seale.)
2. *Chætodon carens* Seale. (After Seale.)

PLATE 16

- Holacanthus lamarchi* Lacépède. (Drawing by A. L. Canlas.)

PLATE 17

- FIG. 1. *Chætodon bella-maris* Seale. (After Seale.)
2. *Holacanthus multifasciatus* Smith and Radcliffe. (After Smith and Radcliffe.)

PLATE 18

- FIG. 1. *Microcanthus strigatus* (Cuvier and Valenciennes). (Drawing by P. Bravo.)
2. *Heniochus singularius* Smith and Radcliffe. (After Smith and Radcliffe.)

PLATE 19

- FIG. 1. *Holacanthus semicirculatus* Cuvier and Valenciennes. (Drawing by A. L. Canlas.)
2. *Heniochus acuminatus* Linnæus. (Drawing by P. Bravo.)

PLATE 20

- FIG. 1. *Holacanthus tibicen* (Cuvier and Valenciennes). (Drawing by J. N. Nievera.)
2. *Heniochus varius* Cuvier and Valenciennes. (Drawing by P. Bravo.)

PLATE 21

- FIG. 1. *Holacanthus trimaculatus* Lacépède. (Drawing by M. L. Nievera.)
2. *Holacanthus diacanthus* (Boddaert). (Drawing by A. L. Canlas.)

PLATE 22

- FIG. 1. *Holacanthus vroliki* Bleeker. (Drawing by J. N. Nievera.)
2. *Heniochus permutatus* Bennett. (Drawing by A. L. Canlas.)

PLATE 23

- FIG. 1. *Holacanthus lepidolepis* Bleeker. (Drawing by A. L. Canlas.)
2. *Holacanthus imperator* (Bloch). (Drawing by A. L. Canlas.)

PLATE 24

- Platax orbicularis* Forskål. (Drawing by A. L. Canlas.)

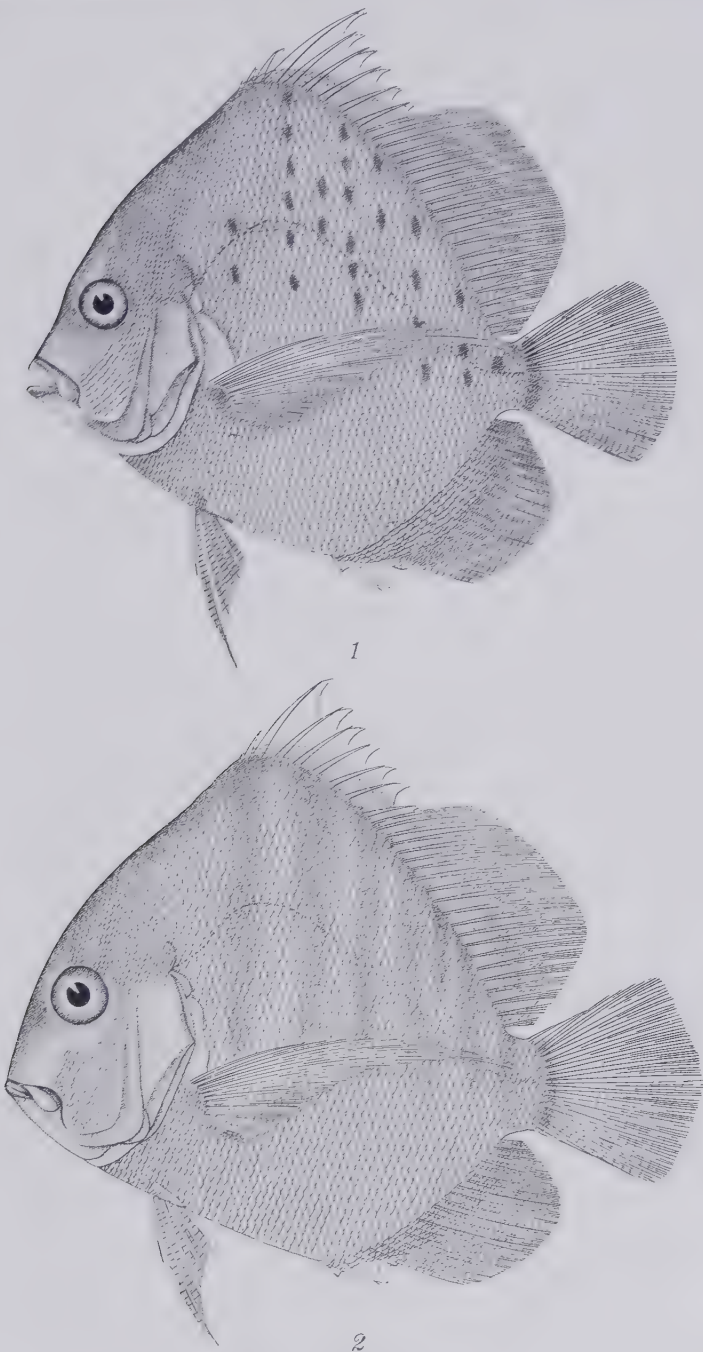


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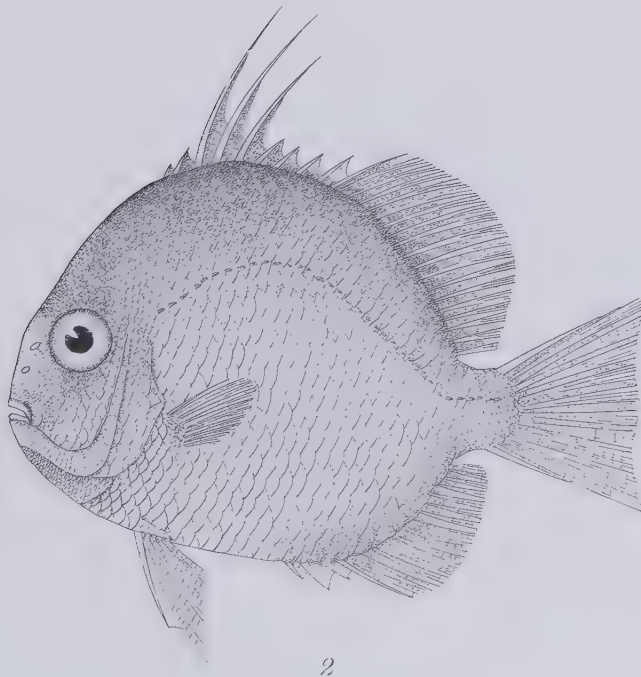


PLATE 2.



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PLATE 3.

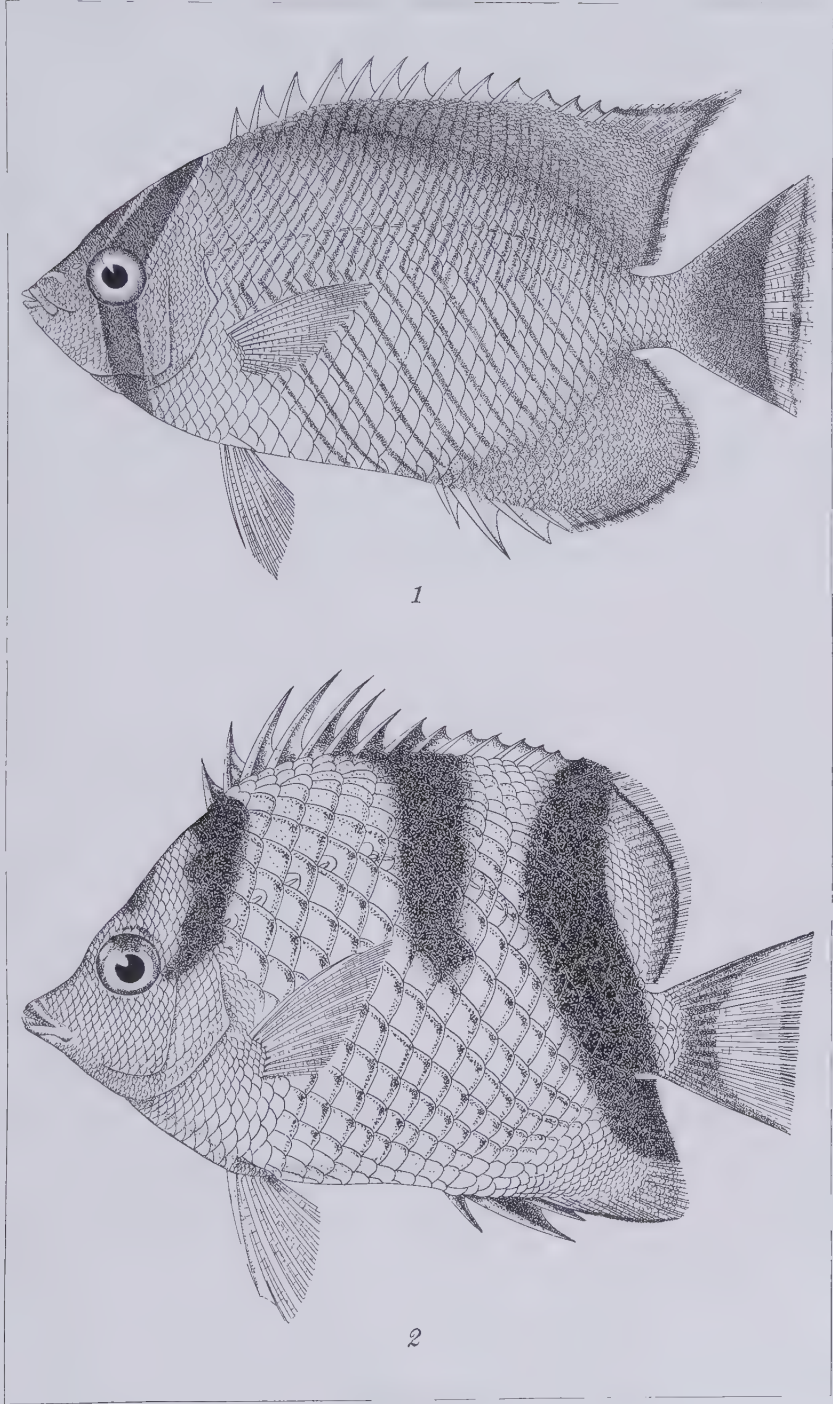


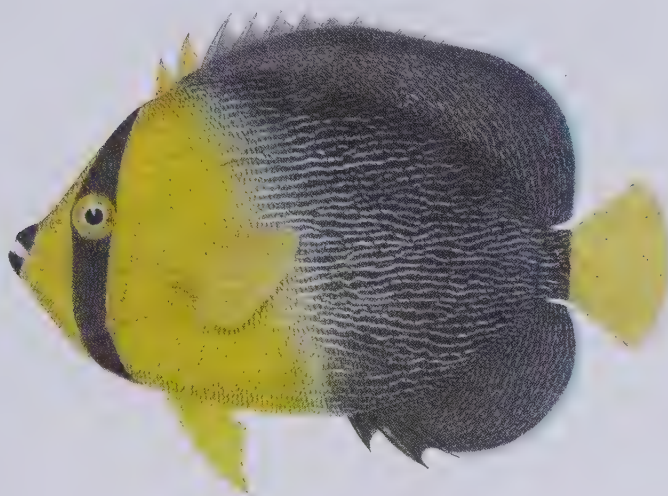
PLATE 4.



PLATE 5.



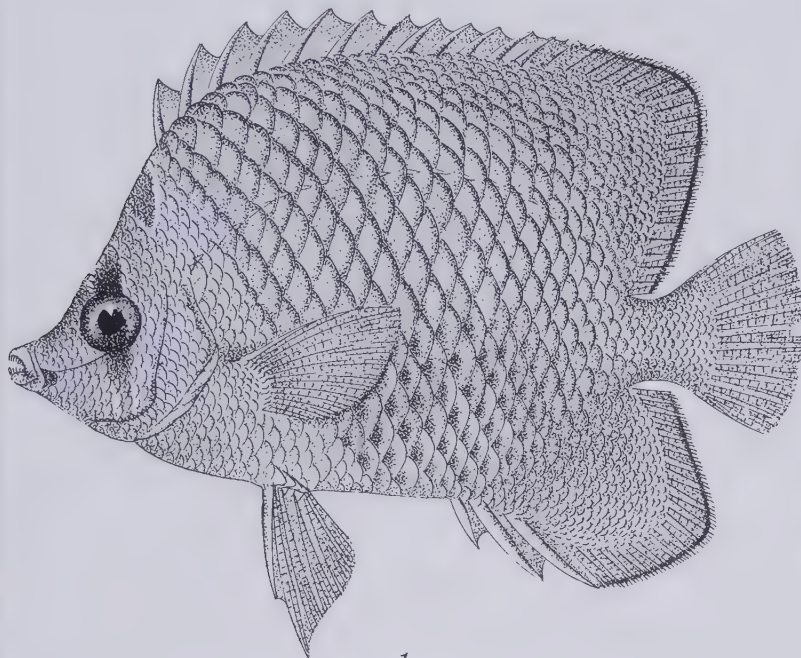
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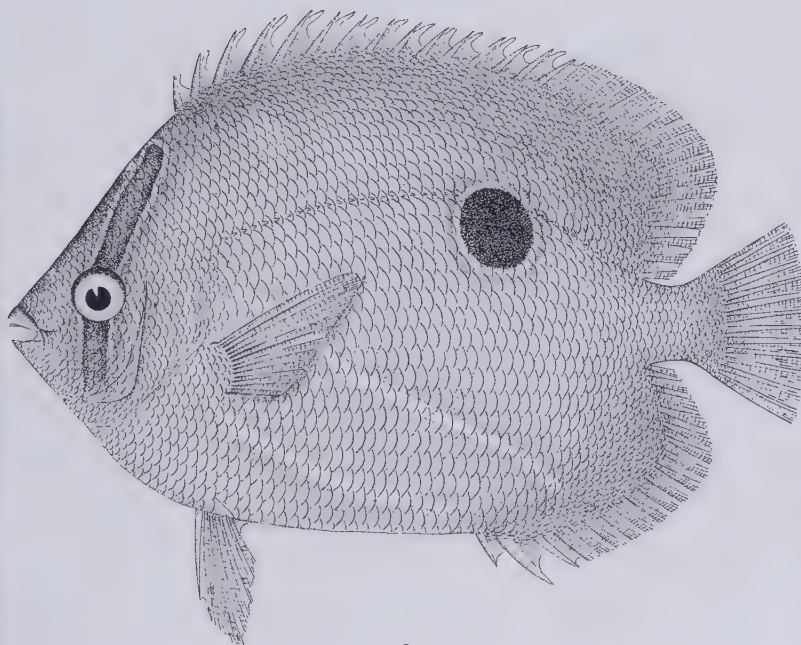
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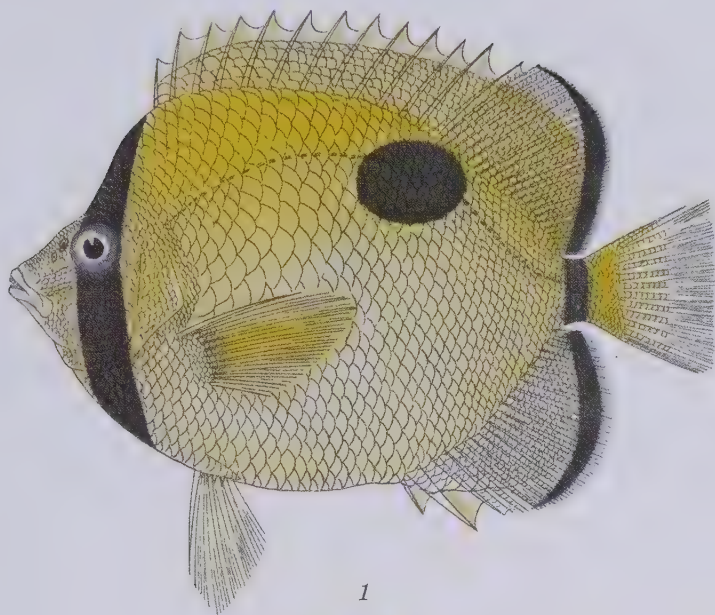


PLATE 11.



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PLATE 12.



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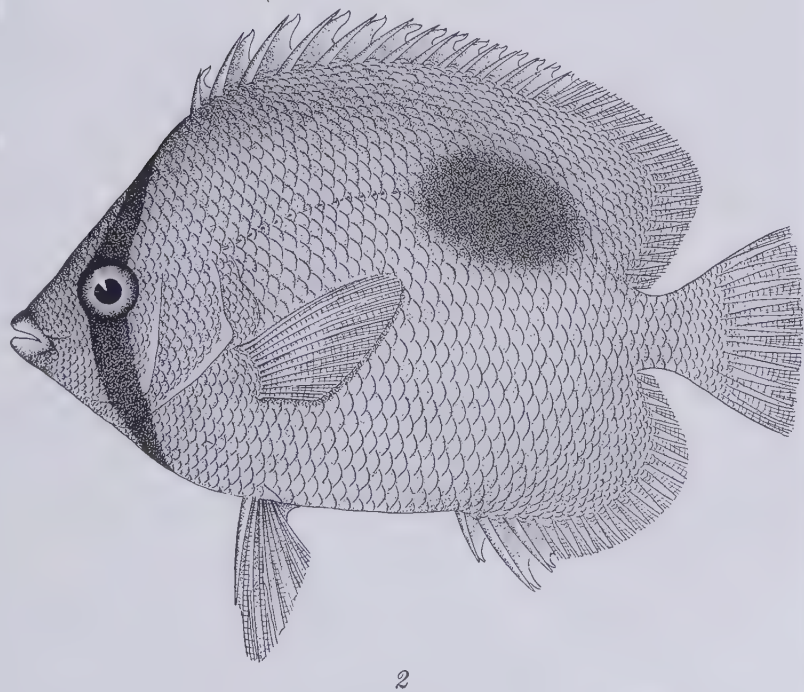
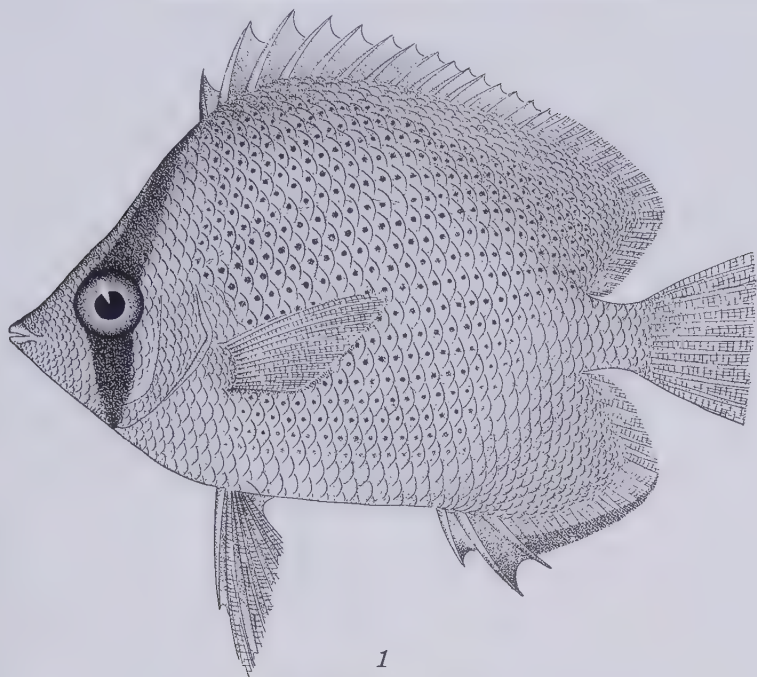


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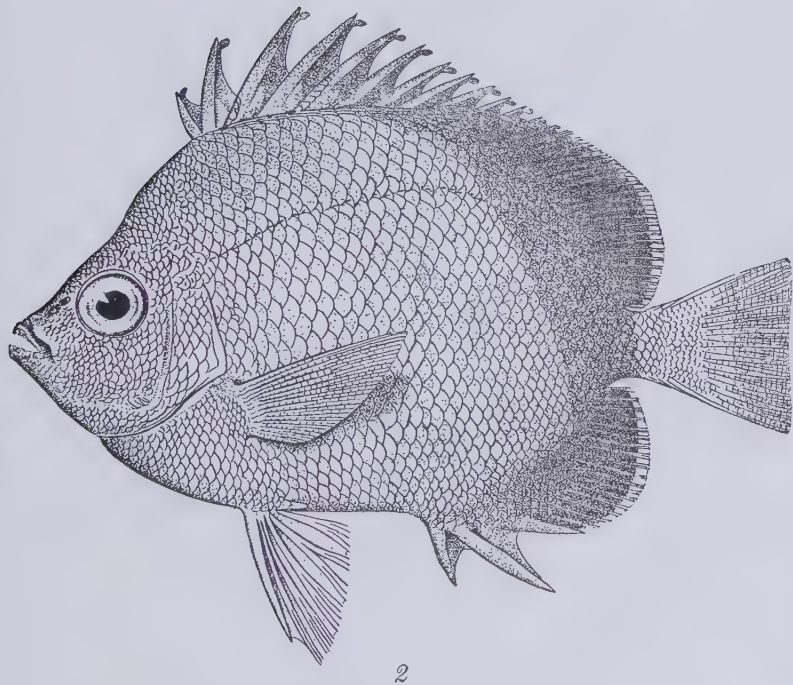
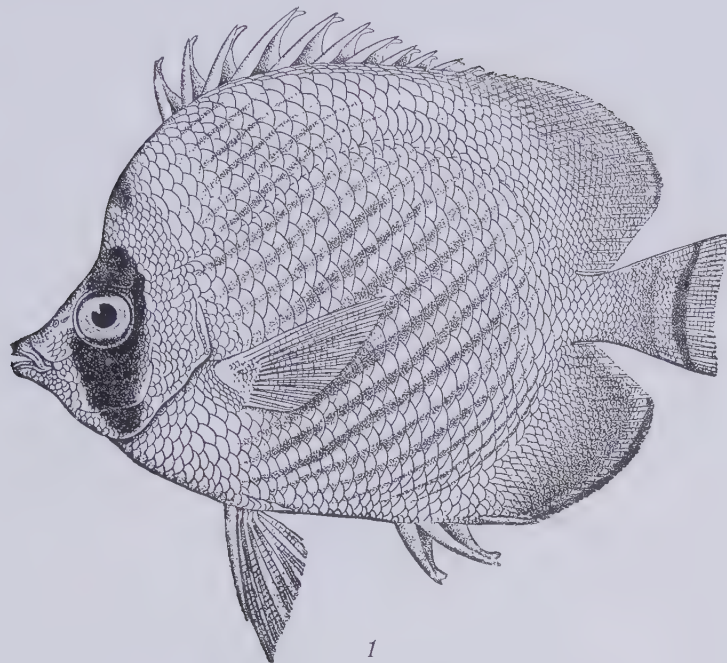
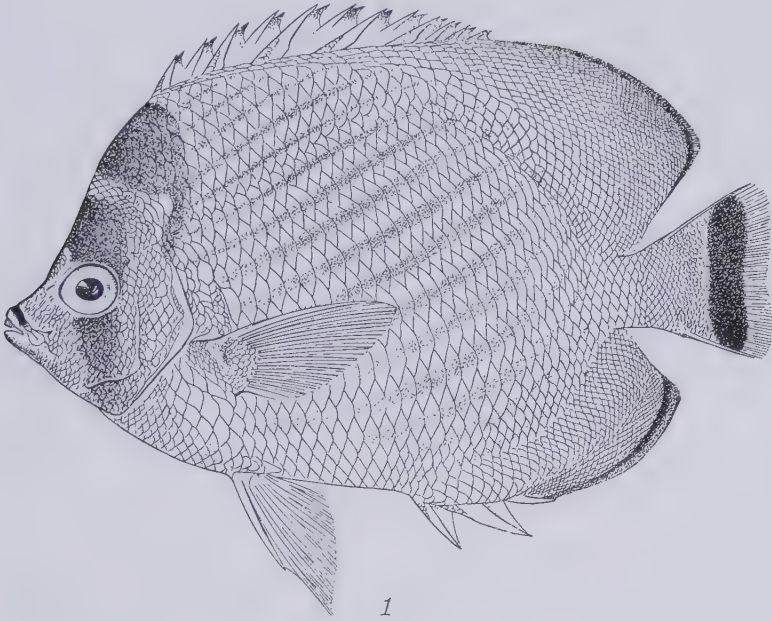


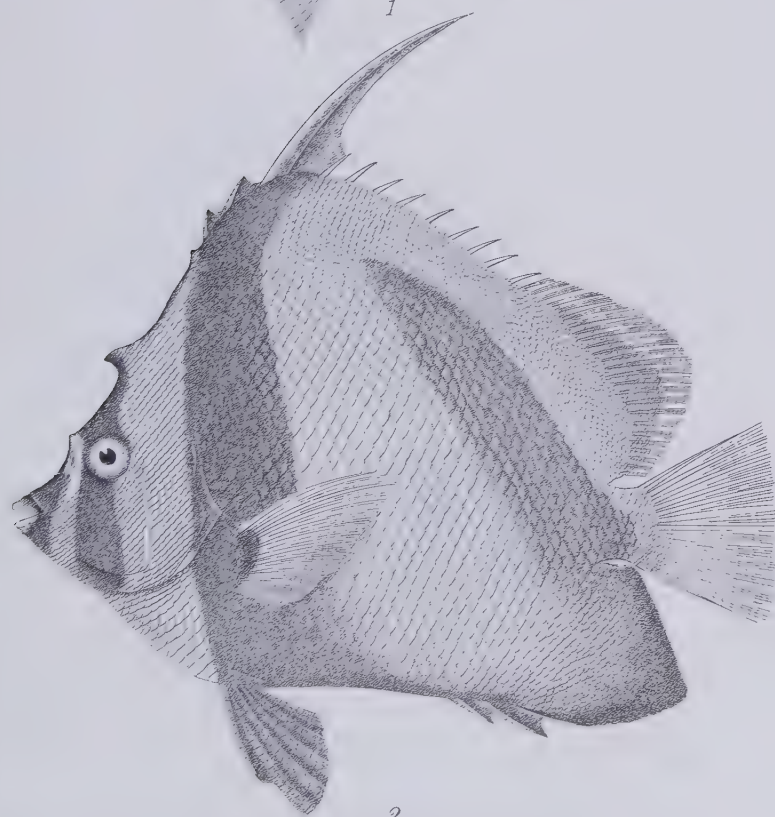
PLATE 15.







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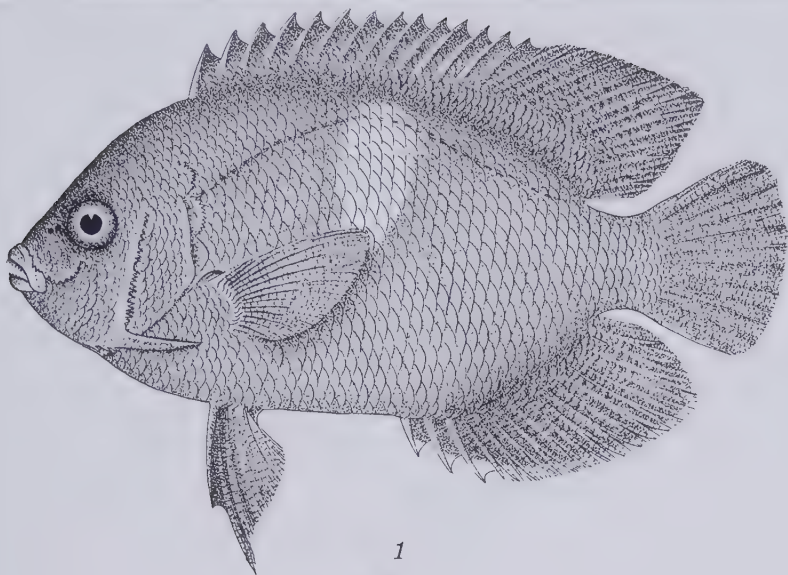


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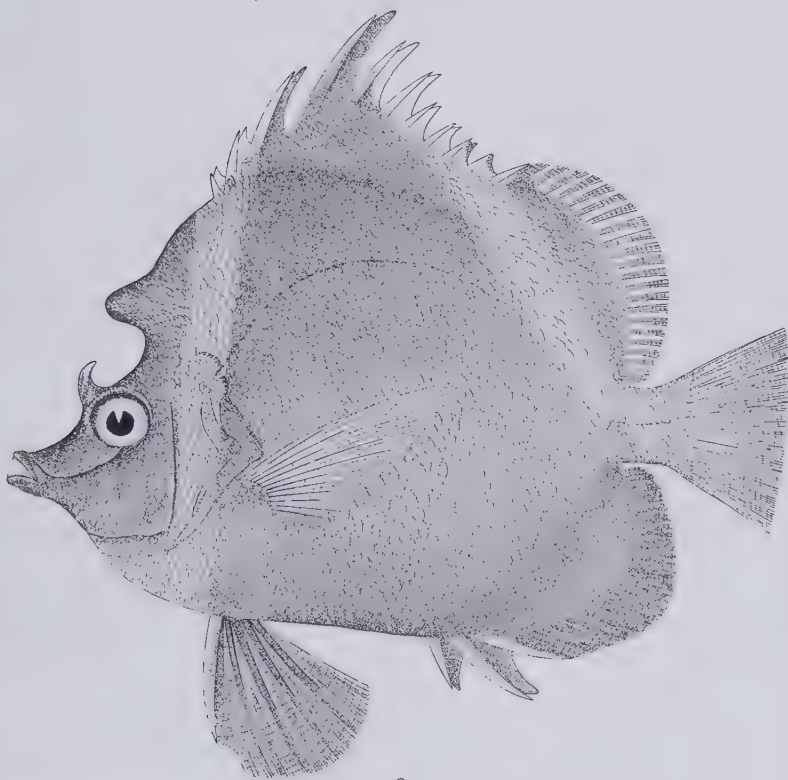


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PLATE 19.



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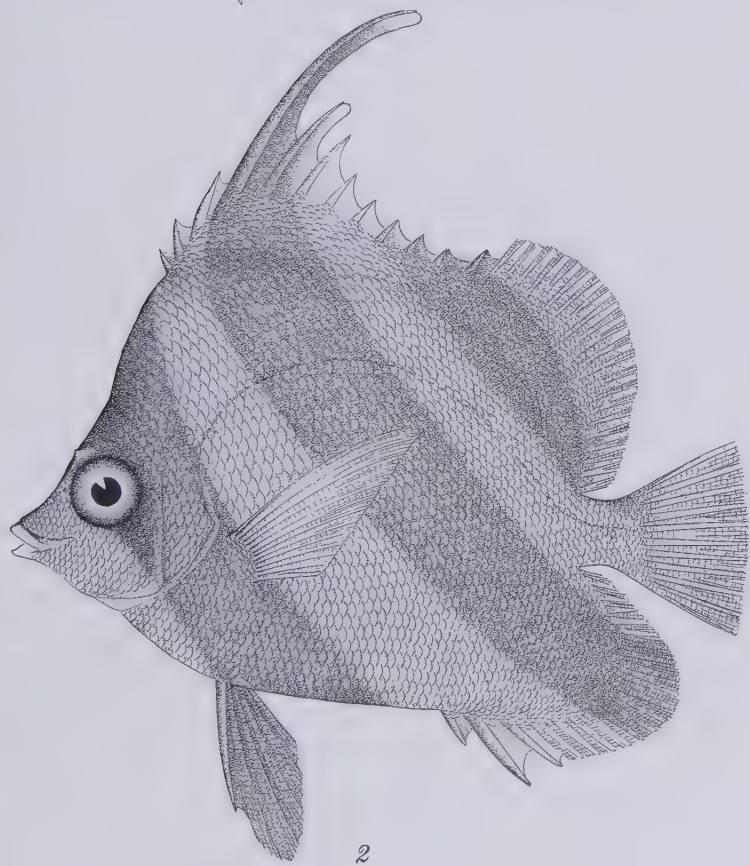
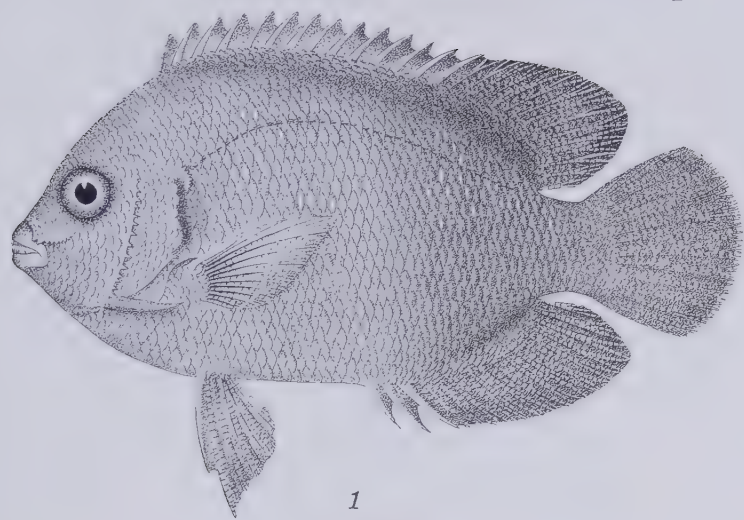


PLATE 22.

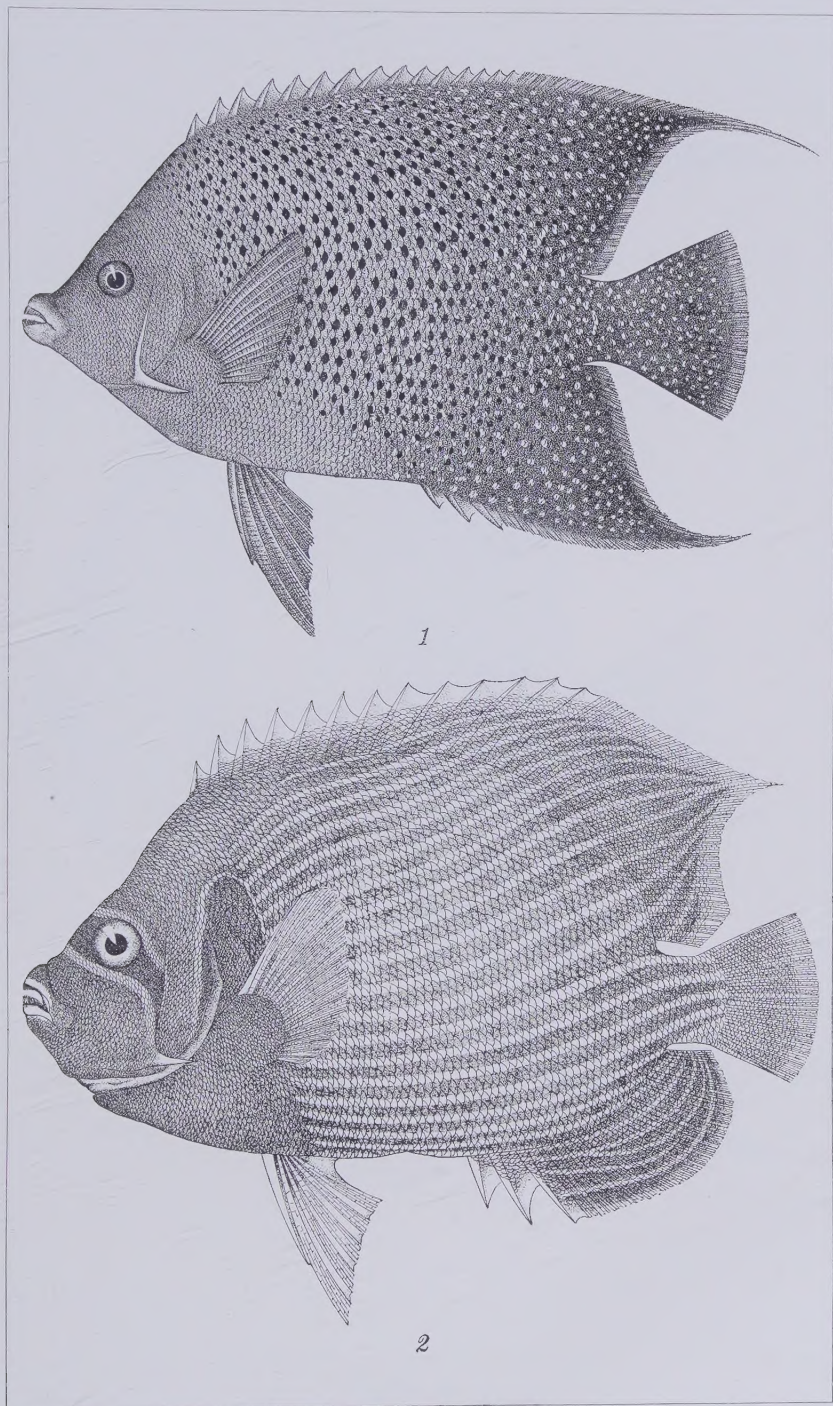


PLATE 23.



PLATE 24.

